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ECONOMIC LIMITS TO CORPORATE GROWTH IN AMERICA

by

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December 2006

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13. ABSTRACT (maximum 200 words)

This work explores the relationship between corporate and economic growth within the United States since 1929. The corporate share of GDP climbed from 52.5 percent in 1929 to 59.7 percent in 2005. Depending upon the years included and the method of estimating respective growth rates, this increasing share of GDP accounts for up to 14 percent of real domestic corporate growth. However, the domestic corporate share of GDP can never exceed 100 percent. Subject to numerous assumptions, the models presented here estimate that this source of corporate growth could be exhausted as early as the year 2032. Given the lack of discussion of this issue in the relevant literature, it is unlikely that current stock valuations account for the eventual loss of this source of growth. The actual effect on stock prices of such a slowdown of domestic corporate growth will depend not only on how far into the future such an event occurs, but also on how successful these corporations are at finding new growth opportunities overseas. More research is needed to better model future growth patterns and to understand the implications on stock valuations and other related policy matters.

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ECONOMIC LIMITS TO CORPORATE GROWTH IN AMERICA

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This work explores the relationship between corporate and economic growth within the United States since 1929. The corporate share of GDP climbed from 52.5 percent in 1929 to 59.7 percent in 2005. Depending upon the years included and the method of estimating respective growth rates, this increasing share of GDP accounts for up to 14 percent of real domestic corporate growth. However, the domestic corporate share of GDP can never exceed 100 percent. Subject to numerous assumptions, the models presented here estimate that this source of corporate growth could be exhausted as early as the year 2032. Given the lack of discussion of this issue in the relevant literature, it is unlikely that current stock valuations account for the eventual loss of this source of growth. The actual effect on stock prices of such a slowdown of domestic corporate growth will depend not only on how far into the future such an event occurs, but also on how successful these corporations are at finding new growth opportunities overseas. More research is needed to better model future growth patterns and to understand the implications for stock valuations and other related policy matters.

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I. INTRODUCTION

In his book *The New Industrial State,* John Kenneth Galbraith mentions in passing that the five hundred largest corporations produced about half of the goods and services of the United States at that time. He notes that while it seemed corporations were initially concentrated in industries requiring large amounts of capital and mass production, they were already—the book was published in 1967—entering nearly every segment of the American economy. The statistics support his observations: over the last 70 years, the share of gross domestic product in the U.S. attributable to corporations has slowly risen from about 50 percent in 1930 to almost 60 percent in 2005.

Whether this trend is good or bad probably depends on the observer's position and is therefore open to debate. However, several points should be beyond argument. First, this expanding share of GDP has been a significant source of growth for corporations, allowing them to grow faster than the general rate of economic expansion. It certainly can be assumed this additional growth was profitable for the corporations and contributed therefore to both their bottom lines and their stock prices. Second, while there is no reason to assume this trend will come to a halt anytime soon, it must be apparent that eventually it must end. By definition, the corporate share of GDP cannot exceed 100 percent, and realistically it is likely to stabilize at some level below that.

While these two facts might be obvious, there has been almost no discussion of this trend or its implications in the academic or professional literature. This study is therefore an attempt to open that dialogue and ensure that the effects of this trend are both understood and anticipated. It first tries to determine whether economic growth will actually at some point impose a limit on corporate growth. Next, it attempts to forecast at what date the effects of that limit might be felt. Finally, it explores the implications of such limits for valuations of corporate stocks.

The study begins with a review of the available literature from the fields of economics, finance and accounting. Available forecasts of economic and corporate growth from both governmental and private sources are presented, and the few instances where the disparity between the two is noted are acknowledged. Next, it presents a variety of methodologies that might be used to quantify the gap between corporate and economic growth and forecast the trend into the future. The sources of data and underlying assumptions are also presented. Third, it presents the findings generated with these methodologies, and offers estimates of when economic limits might begin to slow corporate growth according to the different models. Fourth, it presents a review of stock valuation techniques and uses these techniques to explore the possible implications of slower corporate growth. Finally, some brief conclusions are offered in conjunction with suggested areas for further research.

II. LITERATURE REVIEW

This section contains a review of the relevant literature, broken into five sections. First, it highlights the sources of gross domestic product (GDP) and corporate value-added (CVA) data used in this study. Next, it reviews a variety of GDP forecasts offered by both government and private entities and individuals. Third, it describes the limited literature available pertaining to corporate value-added accounting. Fourth, it summarizes past discussions of corporate growth forecasts. Finally, it details the instances where other authors mention the connections between economic and corporate growth which form the basis of this study.

A. GDP AND CORPORATE DATA

For both economic and corporate data, this study relies primarily upon information from the Bureau of Economic Analysis (BEA). According to its website (www.bea.gov/bea/about/mission.html)[1], the BEA strives to promote "a better understanding of the U.S. economy by providing the most timely, relevant, and accurate economic accounts data in an objective and cost-effective manner". It continually posts new data to its website as updates become available, and revises old data as new information surfaces and definitions and methodologies change. Most of the data are presented by the BEA in tabular format. While many different tables are referenced for this study, two in particular provide the majority of the data upon which this study is based. Table 1.1.5., Gross Domestic Product, provides the annual GDP numbers from 1929 through the present. Table 1.14., Gross Value Added of Domestic Corporate Business in Current Dollars and Gross Value Added of Nonfinancial Domestic Corporate Business in Current and Chained Dollars, provides the corporate contribution to GDP in value-added format.

In a study such as this, it is important to keep in mind three questions when choosing and examining the data. First, what are the definitions and interpretations of the

[1] Last accessed 3 December, 2006.

components under analysis? Most introductory economics textbooks contain a general explanation of gross domestic product and the value-added accounting methods involved here. Mankiw (2004) provides a thorough overview of the concepts, their importance, and how they are calculated. Anderson (2002) provides a similar overview, but includes insight into relevant aspects like chained dollar versus nominal dollar formats. He also provides a cursory overview of economic production from a historical context. For a deeper investigation of GDP, the BEA itself provides a wealth of information. On its website, the BEA provides a glossary of terms that provides simple definitions of the terms and components of GDP and value-added data.[2] While this glossary provides general definitions, the interpretation of these items evolves over time. As a result, the BEA publishes what it calls the "Comprehensive Revision of the National Income and Product Accounts" every four to five years to summarize the latest changes to the definitions and the calculations of the accounts. The most recent of these was published in 2003.

Once a definition of what is to be measured is established, the second relevant question is how well the data measure the intended target. In its *Survey of Current Business*, the BEA publishes (among many other things) papers discussing the reliability of its own measures. Fixler and Grimm (2002) define reliability in this context as a measure of the size of the revisions necessary over time. They conclude that under this definition, early estimates are both reliable and useful. They find that since 1980 revisions to the quarterly estimates of annual GDP averaged just over one percent. Furthermore, they attribute the bulk of these changes to revisions of the concepts and methods involved rather than measurement error.

Moulton (2000) describes not only how recent changes to said concepts and methods have improved the measures, but also what improvements are planned for the future. He cites improvements to chain indices and recognition of software expenses as an investment as a few of the past successes, and better measurements of e-business and employee compensation among improvements expected in future revisions. De Leeuw

2 For official definitions of many of the terms used here see the BEA's glossary at http://www.bea.gov/bea/glossary/GlossaryIndex.htm, last accessed 20 November, 2006.

(1990) examines the reliability of gross national product (GNP) data, and finds that revisions since 1987 have averaged 1.7 percent. Ehemann and Moulton (2001) explore the inconsistencies between product and income estimates of GDP. They find that the discrepancy between the two peaked in 1993 at 1.0 percent of GDP, and that the income-side measure of growth exceeded the product-side measure by 0.3 percentage points on average between 1993 and 2000.

In their recent NBER working paper Corrado, Sichel and Hulten (2006) question whether the accounts accurately measure intangible investments. They suggest that economists should reclassify expenditures on copyrights, brand marketing and training as investments rather than as expenses. They argue that such a move could double investment as a percentage of GDP in the most extreme cases, and dramatically shift the share of GDP among the different components.

Finally, Landefeld and Parker (1997) and Landefeld, Moulton and Vojtech (2003) explore the use and interpretation of chain indices in time-series economic data. They cite improvements in BEA forecast accuracy as the primary benefit of using chain indices. However, they also point out the limitations of these indices, such as the fact that they are not additive in nature.

This study focuses on the relationship between the GDP and corporate data over time. Therefore, the third important question is whether the two data sets are comparable. The goal is to ensure that data for each are measured, calculated and reported using the same methodologies. In the simplest of terms, the goal is to ensure that apples are compared to apples. A review of available literature finds remarkably little discussion of whether GDP and CVA data are comparable. The definition of "value added" from the BEA's website suggests that the two are comparable in saying that value added is the "the contribution of an industry or sector to gross domestic product (GDP)". While a review of the literature on corporate value added is presented later in this section, it should be worthwhile here to point out that very little has been written on the topic in the U.S. Likewise, what has been written discusses the concept generally, not specifically addressing its use or measurement of U.S. GDP. A phone call to the BEA expert on corporate profits, M. Gregory Key (April, 2006), provides the only confirmation on this topic. During the conversation, Key affirmed that the BEA's statistics on corporate value added are directly comparable to GDP information, and form a subset of the overall GDP by representing the portion of GDP produced by corporate entities.

B. GDP GROWTH FORECASTS

In an exploration of whether GDP growth will serve as an upper bound to domestic corporate growth, the relative growth rates of each and the percentage of GDP constituted by corporate value added are the key measures under investigation. Not only can domestic corporate value added not exceed GDP, but realistically there is some share less than one hundred percent at which point the corporate share will stabilize or begin to recede. Therefore, accurately forecasting annual growth rates in the decades ahead is central to successfully estimating how soon a change must occur.

While forecasts of U.S. GDP for the next quarter or year are plentiful, the number of forecasts available decreases rapidly as the timeframe considered expands. As the period relevant to this study is better measured in decades than single years, a review of relevant forecasts becomes more manageable. The largest producer of such estimates is the federal government. For the ten to fifteen year horizon, no fewer than four agencies and organizations make forecasts about future economic growth. These include the Council of Economic Advisors (CEA), the Congressional Budget Office (CBO), the Government Accounting Office (GAO), and the Social Security Administration (SSA). Additionally, the Federal Reserve Banks, Department of the Treasury and Department of Defense all discuss the question to some degree either independently or based upon the data of the first four organizations.

In its most recent annual report, the CEA (2006) estimates that through 2011 real GDP growth will average between 3.1 and 3.3 percent annually. They suggest this estimate presents the low end of possible outcomes as they believe it is based upon "conservative economic assumptions". This reflects their consensus that caution and prudence are desirable traits for such forecasts. While specific estimates beyond 2011 are not cited, the report acknowledges that economic headwinds—such as low workforce growth rates, steady to decreasing average hours worked, stable labor participation rates, and slowing productivity gains—suggest that their forecast beyond 2011 would not be any higher.

Estimates outside the executive branch are similar for this timeframe, and become even more conservative as the horizon expands. CBO (2006a) projections through 2011 are largely in line with those of the CEA, forecasting annual GDP growth of 3.4 percent in 2007 slowly decreasing to 3.1 percent during the 2008-2011 timeframe. However, its estimate drops to only 2.6 percent annually for the years 2012-2016. As GAO estimates are based primarily upon the CBO's other assumptions, it is no surprise that they reach the same conclusions about GDP growth during this timeframe.

Perhaps no organization is as focused on examining long-term trends in the underlying economic factors as the SSA. In fact, many of the other studies rely to some extent on SSA estimates of demographic characteristics. These characteristics include fertility rates, life expectancies, immigration rates and labor force participation rates, among others. They also estimate productivity gains, although these do not appear to have been explicitly incorporated into other agencies' forecasts in the same fashion as the demographic data. The SSA cites estimates of annual GDP growth of 2.6 percent for the period from 2005 through 2015, based largely on employment gains averaging 0.9 percent per year and productivity increases of 1.7 percent annually. It should be noted that the SSA takes these numbers from the "intermediate" of its three estimates. Unlike the other organizations, it tries to highlight the risk inherent to its finances in the estimates by showing low, intermediate and high outcomes. Average GDP growth is roughly 0.4 percentage points higher at 3.0 percent per year in its low-cost scenario. (Because it estimates net costs to the system, and higher GDP growth leads to higher tax revenues, it refers to the most optimistic growth scenario as the "low-cost" case). Likewise, GDP growth is about 0.4 percentage points lower at 2.2 percent in the high-cost simulation.

Of these government organizations, only the SSA ventures estimates beyond this midrange time horizon. While the others limited their forecasts to 2016 at the latest, the most recent SSA report (Board of Trustees, 2006) offers forecasts for its three scenarios out to 2080. For the period 2020 through the year 2080, the low-cost scenario forecasts annual GDP in the range of 2.6 to 2.8 percent, the intermediate a range of 1.9 to 2.1 percent, and the high cost a range of only 1.0 to 1.7 percent per year.

It is of course desirable to compare these forecasts to those of academic and independent authors to see if any large disparities can be found. A review of the literature finds two different but related approaches to estimating future economic growth on the non-governmental side. One side tries to answer the question of how fast the economy *can* grow. Economists such as Krugman (1997) and Blinder (1997) both predicted inherent limits on U.S. economic growth of 2.0 to 2.5 percent for the foreseeable future. While the economy has consistently produced growth rates exceeding these numbers in the years since these works were published, it should be pointed out their arguments focus on sustainable long-term rates, and their estimates align considerably better with long-term government forecasts than they do with recent actual performance.

In addition to discussions of how fast the economy might grow, the second approach taken replicates the approach taken by government organizations in estimating how fast the economy *will* grow. Private estimates show a more varied range than the government estimates. Global Insight (2005) estimates that real GDP growth will average 3.1 percent from 2005-2017. Jorgenson and Stiroh (2000) forecast growth of 3.35% through 2010 for non-farm business. They point out that their findings are quite consistent with the CBO's estimate of 3.5% for that period. Jorgenson, Ho and Stiroh (2006) predict a range of 1.9 to 3.5 percent through 2015 for the economy as a whole, with their midrange estimate at 3.0 percent. At the same time, the Economist Intelligence Unit, a research and data arm of *The Economist*, forecasts average growth of 2.7 percent over the next 25 years. Hanson (2000) presents a long-term model that attempts to model world economic growth throughout human history using the sum of four exponentials. He offers a theory that current stock prices could be justified if the economy attains a higher level of sustainable productivity growth. Jones (2002) does not present an actual forecast, but argues that 80 percent of recent economic growth is due to unsustainable factors. He claims that the bulk of this growth was due to increases in research intensity and educational levels. Because these activities can not exceed 100 percent of economic activity, he suggests these changes are transitional and therefore will not continue indefinitely. Similarly, Landefield and Fraumeni (2001) examine the impacts of technology on economic growth. While they find computers and software are contributing significantly to economic growth, they do not find evidence supporting "new economy" theories of a radical jump in potential growth.

C. CORPORATE VALUE-ADDED ACCOUNTING

Any attempt to directly compare GDP and corporate numbers faces substantial difficulties from the start. As Landefeld and Fraumeni (2001) point out, corporate sales data are substantially different from economic output measurements. This is largely because traditional financial (corporate) accounting differs dramatically from the methods used by economists. While corporate data focus on compliance with generally accepted accounting principles (GAAP), economic data focus on measuring the economic essence of what is happening. For instance, GAAP handles the depreciation of assets in a variety of ways, many of which allow the asset to be depreciated faster than its useful life. Analysts building GDP information must regularly adjust such numbers to better represent exactly how much of the useful life of the asset has been consumed. Significant differences also exist in valuing inventories, the differences between sales and gross output, and the treatment of transfer payments. Therefore, to make accurate comparisons it is necessary to first convert the sets of data into similar formats. Value-added (VA) accounting essentially performs this task. It takes corporate earnings statements and puts them in a form similar to that used by economists.

Although value-added accounting never gained acceptance in the United States, it experienced a boom of sorts overseas in the 1970s. Morley (1979) provides a review of its use and application in Britain. He points out that one quarter of the top 100 British companies included VA statements in their annual reports at that time. He cites some of the history of VA accounting (dating back to its use by the U.S. Treasury in the eighteenth century), discusses general calculation techniques, conversion of normal accounting entries to a VA format, and some advantages and disadvantages of the various formats. More recently, Evraert (1998) in France and Worthington and West (2001) in Australia offer reviews of the limited literature in the field.

Several authors have found that VA statements, while infrequently used, do contain useful information. Von Staden (2000) highlights their utility in illuminating the division of the created wealth among all of the stakeholders in a corporation. The term “stakeholders” in this case is used in the limited sense, referring to those who provide value to the business process and are compensated for it. This would include suppliers, management and labor, creditors, owners and possibly the government by way of taxes and subsidies. Slightly more relevant to this paper are the works examining the predictive value of VA statements. Both Riahi-Belkaoui (1999a) and Worthington and West (2004) suggest that measures of corporate value added are better predictors of future performance than traditional earnings statements. Perhaps the most complete survey of the value-added landscape is Riahi-Belkaoui’s 1999 book *Value added reporting and research: state of the art*. Not only does it cover all of the concepts discussed elsewhere, but it also includes reprints of many of the previously cited studies on this topic.

While these works provide an excellent introduction to VA accounting, they are lacking in two areas relevant to this work. First, all are focused on the use of value-added techniques at the corporate level. None discuss using this data in any sort of aggregate above the individual company level. Second, while speaking to VA concepts generally, none explain specifically how the U.S. Bureau of Economic Analysis (BEA) computes value-added information. For this type of information, the BEA’s Glossary and *Survey of Current Business* are the only sources.

D. CORPORATE GROWTH FORECASTS

As described in the last section, the virtual absence of value-added methodologies from corporate practice means that there is little coverage of corporate-growth forecasts in such terms—neither for single corporations nor in the aggregate. However, a plethora of information discussing corporate forecasts in terms of earnings, dividend growth and the appreciation of corporate stock is available. While different in their intent, units of measurement and methodology, these studies do provide valuable insight on corporate growth from an alternative perspective. With a few assumptions and some manipulation, at least rudimentary comparisons can be made between these and economic forecasts.

Estimates of past returns provide a vantage point from which to begin discussions of future growth possibilities. Ibbotson and Chen (2003) decompose returns between 1926 and 2000 into subunits using six different methods. In each case the overall geometric average return is 10.7 percent, with 3.08 percentage points of that attributable to inflation. Shiller (1989) examines the slightly longer period between 1872 and 2000. Fama and French (2002) use this data to calculate an average real return of 7.43 percent, and discuss hypotheses as to why this return exceeds the amount forecasted by risk and return models. The equity premium—the rate of return to stocks in excess of the risk-free rate—is the subject of numerous studies, including Graham and Harvey (2001) and Polk, Thompson and Vuolteenaho (2004). Modigliani and Cohn (1979) and Campbell and Vuolteenaho (2004) explore the effects of inflation on stock prices and expected returns.

Almost any corporate finance textbook explores the basic theory underlying stock pricing and forecasting earnings. Brealy, Myers and Allen (2006) provide thorough coverage of these topics. Beaver and Morse (1978) expand in detail on these ideas, and also suggest that differences in accounting method may account for the persistence of price-to-earnings ratio differences over the years.

E. THE RELATIONSHIP BETWEEN CORPORATE AND ECONOMIC GROWTH

Thus far, the works reviewed generally focus on either the corporate or the economic realms, but few discuss the relationship between the two. Although a work directly examining corporate value added as a percentage of GDP has yet to be found, several works at least either acknowledge the conceptual underpinnings of this paper's argument or mention in passing that such a relationship ought to exist.

Fair (2000) explores future corporate growth scenarios necessary to justify current stock prices. He finds that most scenarios require highly optimistic assumptions, such as ten years of 14.2 percent annual earnings growth or a decade of productivity growth in excess of 2.5 percent. Of particular relevance to this study is his acknowledgement that nominal GDP growth of 6 percent, combined with 14.2 percent earnings growth, would increase the annual share of GDP going to profits to 11.9 percent within ten years. While only a subset of the overall corporate value added, he points out that such a historically high ratio would probably never occur due to social and political forces. While he limits his study to just the profits, his logic essentially mirrors that found later in this paper applied to the corporate sector as a whole. Siegel (2002) picks up on this point, showing that corporate profits have ranged from 10.6 percent to -4.33 percent of national income since 1929. He argues that in the long run profit growth must be limited to national income growth, lest it comrpise an ever-larger share of national income at the expense of the other stakeholders.

Several other authors cite similar ideas under a variety of situations. Hanson (2000) speaks in general terms regarding this concept. He points out that generally as a subset grows as a percentage of the whole set, it is the slowing of the subset's growth which usually restores the equilibrium rather than a long-term increase in the overall set's growth rate. Jones (2002) mentions this concept in the field of research. He states that labor growth in this area is limited in the long run to overall labor growth because labor in this field can never exceed 100 percent of available labor. Steurle and Spiro (1999) identify a similar situation in government spending on the elderly. They point out that "No government program, no matter how important, can always grow faster than the economy and absorb an ever-increasing share of the nation's output." While these two previous works cover topics very different from the one here, their logic should apply equally well to the economy and its corporate subset. Arnott (2004) mentions the issue in passing, taking the financial analysis industry to task for consistently forecasting earnings growth in excess of the economic growth rates generally seen as sustainable.

III. METHODOLOGY

The ultimate goal of this study is to assess whether or not the corporate segment of the economy has historically grown faster than the economy as a whole. Like most studies, it is first necessary to answer the two fundamental questions of what to measure and how best to measure it. This section examines each question in turn, and provides insight into the author's approach, reasoning, assumptions and methodologies.

A. DATA SELECTION

To draw comparisons between the corporate sector and the overall economy, one must first find relevant data for each segment and convert them into a format suitable for valid comparison. As is often the case in such research, the possible approaches are many and each has its own merits and limitations. For the overall economy one could look at the gross domestic or national products, the national or domestic incomes, or a host of other indices that attempt to capture the status of the national economy as a whole. On the corporate side the options are equally numerous. There are numerous profit, earnings, dividend and return measures that try to capture outcome from the perspective of the stockholders. Additionally, there are others indicators like sales and value added that portray different images of the corporate sector.

As the focus of this paper is upon corporate production and not profits or income, gross domestic product seems a better fit than gross domestic income. Gross domestic product is chosen over gross national product simply because it is the format reported directly by the BEA. GDP data were assembled, in nominal dollars, for the period 1929-2005. This information was drawn directly from the Bureau of Economic Analysis (BEA) website at www.bea.gov, Table 1.1.5 Gross Domestic Product.[3]

An alternative approach would be to measure growth in inflation-adjusted format. Real GDP data are available from the BEA and are appealing as a potentially more accurate measure of the economy over time. Nonetheless, this author ultimately elected

[3] Last accessed 3 December, 2006.

not to use the data in this form due to concerns about its accuracy over long periods of time. As Landefeld, Moutlon and Voutech (2003) point out, the BEA real GDP figures are computed used Fisher indexes, which take a geometric mean of a Laspeyeres index and a Paasche index. The Laspeyeres index uses the prior year's prices to capture changes in quantity produced, while the Passche index uses the later period's prices to capture the change in production from the year prior. As a combination of the two, the Fisher index does a better job of stripping out inflation over time. However, this improvement comes at a price. Because the Fisher index holds prices constant between periods, it cannot be used to accurately measure the share of any sub-component of GDP in dollar terms. While the error is small for short periods with gradual changes, the problem is more pronounced over longer periods with rapidly falling prices. It therefore is an important consideration for items such as computers and other technology-laden industries. These industries are a major source of both corporate and economic growth (Jorgenson and Stiroh, 2000). While there are methods of reducing these effects to improve the real dollar figures, their complexity exceeds their utility for a work of this scope. It is worthwhile to note, however, that the use of real dollar numbers as presented by the BEA would show an even more pronounced growth pattern of corporate value added as a share of GDP than the nominal data used here.

Having chosen the data to represent the economy, it is necessary to next find corresponding data for the corporate sector. While corporate performance is usually considered from either a sales or profit standpoint, neither perspective is sufficiently analogous with GDP to allow useful comparisons (Landefeld and Fraumeni, 2001). When aggregated across firms, sales data overstate the corporate case by essentially double counting portions of production. An example may prove useful in illustrating the point. Assume one corporation makes a car stereo, which it sells to another corporation that makes autos. The second company then installs the stereo in one of its vehicles for sale to a consumer. Sales data would capture the sale of the stereo to the second corporation and then capture it again as a portion of the sale to the final buyer. While this may be fine for some measures, it is not consistent with the format of GDP, which captures only the value added in the process. Therefore a sales approach must be ruled out.

The profits and earning data, on the other hand, understate the corporate case by capturing only the return to the stockholders. GDP data paint a broader picture, including wages and benefits earned and accrued by workers, interest payments to bondholders, consumption of capital and so forth. For that reason a broader measure of corporate performance is needed if fair comparisons are to be drawn between corporate activity and the economy.

In the end, corporate value-added (CVA) data are used to represent the corporate side of the relationship. While value-added approaches are not frequently discussed in the corporate literature, this method has two distinct advantages. First and foremost, CVA information is calculated in the same fashion as GDP, making it the best measure by which to compare the corporate sector to the overall economy. Second, this information is also tracked and disseminated by the BEA. The fact that the BEA produces both datasets provides additional assurance that the methodologies used to produce each set are comparable.

Nominal CVA data for the same period comes from the BEA website's Table 1.14 Gross Value Added of Domestic Corporate Business in Current Dollars and Gross Value Added of Nonfinancial Domestic Corporate Business in Current and Chained Dollars. The table also includes chained-dollar measures of real CVA for the non-financial sector, but these data are not focused upon because of the previously mentioned issues with chained indices.

B. MEASUREMENTS OF ECONOMIC AND CORPORATE GROWTH

When measuring the relative historical growth rates of the U.S. economy and its corporate sector and the evolving relationship between them, two approaches can be taken. One avenue is to estimate each growth rate individually and then examine the difference between them. Alternatively, it is possible to examine the changing proportion of GDP supplied by the corporate sector over time, and then estimate the trend directly from this information. Both approaches and their results are presented here.

Similarly, within each approach several techniques exist to estimate the trends. The first is to just take an average of past changes as representative of the historical picture. The merits of such an approach include both its simplicity and the frequency of its use in examining past growth rates of both economic and corporate performance. The downsides are that it lacks some of the rigor of a more complex approach and that it provides only a point solution which lacks any measures of the level of confidence one has in its value as an estimator.

A second approach is to subject the data to some form of regression analysis. This approach provides more robust information, to include levels of confidence and measures of how fully the model explains the measured outcomes. It also allows the researcher to explore different hypotheses regarding what factors may drive (either in the causal or correlated sense) the results, and subsequently make statistical assessments of the relative merits of each hypothesis. On the downside, such an approach can rapidly increase the complexity of the analysis by requiring the researcher to accurately identify and measure the factors that predict the dependent variable.

As this author's hope is merely to begin and not end the conversation on the relationship between corporate growth and the economy, both approaches are presented here with only minimal commentary on the merits or flaws of either. It should be noted that each approach tells a similar story of corporate value added increasing as a percentage of the gross domestic product over time. Only the pace of this trend changes between the models.

One last consideration worth highlighting is the question of what data range ought to be included in the analysis. The fact that the BEA has relevant data available only from 1929 through 2005 provides one limit. Within this range a strong argument can be made that the entire set should be included. This provides the widest view on the historical picture. It also minimizes possible biasing caused by a researcher narrowing the scope to incorporate only evidence supporting his desired outcome. On the other hand, two events occurred during the first 15 years of available data that generally are regarded as the most unusual and perhaps unique events in modern American history: the Great Depression and World War II. Both had profound impacts on the structure and growth of both the corporate sector and the overall economy. Likewise, events of similar magnitude are considered unlikely in the future. As a result, inclusion of their effects when attempting to estimate future events could distort the picture. Therefore, it may be sensible to treat them as outliers and drop them from the data. Rather than choose sides in such an argument, the researcher presents both approaches. Finally, the even more limited timeframe of 1946 to 2001 is also analyzed. While this range is selected simply to show the effects of choosing only the most favorable data range, it may also satisfy those who claim that the attacks on 9/11 and the ensuing war on terror are also aberrant events with significant impact on the data.

To calculate average growth rates from the data, a geometric average across the relevant period is used. To calculate the geometric growth rate over any period we can use the formula:

$$X_t = X_0 * (1+g)^t$$

where X_t is the variable of interest in any period t, X_0 is its value in the initial period, g is the growth rate to be calculated and t is the number of periods in question. Solving for growth yields the equation

$$g = (X_t/X_0)^{1/t} - 1$$

This approach is used to calculate the growth rates of both GDP and CVA over the three different selected timeframes.

An alternate approach to estimating growth is to use regression analysis. The simplest model is constructed with time as the independent variable and the size of the corporate sector or overall economy in any given year as the dependent variable. For simplicity, the first year in any given sample is labeled as year 1, with subsequent years numbered consecutively after that. To account for the compounding effects of growth, a power relationship is assumed. Therefore, the value of the dependent variable (usually either GDP or CVA) in any year can be predicted as a combination of an initial value (the intercept) times the growth rate (here portrayed as G to minimize confusion between models) to a power representing the number of periods which have passed since the initial point. Mathematically this simplest case can be written as

$$Y_t = Y_0 * (G)^t$$

The equation can be converted to a linear relationship by taking the natural logarithm of both sides:

$$\ln(Y_t) = \ln(Y_0) + t * \ln(G)$$

To simplify notation, Y'_t is used to represent ln(Y(t)), Y_0' in place of $\ln(Y_0)$ and G' in lieu of ln(G). The equation therefore can be written as

$$Y'_t = Y_0' + G' * t$$

which is linear and can be estimated with a standard least squares regression. The years covered in the sample are plugged in as the independent variables, while the logs of the size of the economy or corporate sector in each year are inserted as the dependent variables. The regression analysis provides an estimate of G', which is the log of the annual growth rate. The analysis also provides estimates of the goodness of fit of the model overall, and levels of confidence in the estimates. This approach is used to estimate the historical growth rates of both GDP and CVA using data for all three data ranges.

Such simple models are certainly open to criticism, particularly that they do not incorporate factors likely to drive the growth rates of both GDP and CVA. Factors like inflation, population growth and productivity improvements are all known to play significant roles in nominal and/or real growth. However, all of these are likely to affect both economic and corporate growth in similar fashions. If the effects are comparable on both CVA and GDP, they will cancel each other out when looking at the ratio of the two. The case is most easily seen with inflation. The ratio of nominal corporate value added to nominal gross domestic product should be the same as the ratio of real corporate value added to real gross domestic product for any given period. Therefore, as long as there is no reason to suspect that inflation affects corporate growth differently than economic growth, its impact on this study ought to be negligible and it may ignored. While perhaps less obvious, the arguments for excluding demographic trends and productivity changes are similar. There is little compelling evidence that either of these affects corporate activities in a vastly different manner than the overall economy.

There are two additional limitations related to more complex multivariate models that argue against their use here. First, the search is still ongoing for a model that can accurately forecast growth. Any attempt here to undertake this extremely complex endeavor risks digressing into this separate but related field and never returning. It is therefore left to future works to determine to what extent more complex models will be able to improve upon the estimates found here. A second limitation is the fact that these more robust models tend to be built for forecasting growth in months or at best years ahead, while the timeframes of relevance here are decades and even centuries. Effective use of models dependent upon a host of variables will be hampered by the inability to forecast these variables beyond the near future.

Despite these concerns, several multivariate models are considered here. The first addresses the issue of whether or not the growth trends are different during periods of recession and war. If so, anyone trying to forecast growth using one of these models must decide whether or not he expects similar downturns and periods of war in the future, because inclusion or exclusion would alter the forecast. It seems reasonable to hypothesize that growth for both the overall economy and the corporate sector are fundamentally different during periods of recession and periods of war, and that these effects might not be the same on GDP as they are on CVA. For instance, government production might be expected to increase faster than corporate production during a wartime mobilization of the economy, while government activity may not decrease as rapidly as corporate activity during periods of recession. Therefore, two dummy variables are added to differentiate these cases.

To examine this more complex picture, the data must be approached from another angle. The simple regressions modeled constant growth and looked at the change in size of the economy or corporate sector over time. However, the inclusion of dummy variables picks up differences in growth between periods with and without these events.

It does not easily portray their cumulative effects. To accommodate these differences, instead of trying to forecast the size of GDP or CVA in any period, it is easier instead examine the annual change in the ratio of CVA to GDP, noted here as G_t. In this case the change in the ratio for any given year is

$$G_t = (CVA_t/GDP_t)-(CVA_{t-1}/GDP_{t-1})$$

where CVA_i and GDP_i are the nominal values of corporate value added and gross domestic product for year i. A regression analysis can assess whether changes to the ratio can be represented with a simple linear model. The model estimates the change in the ratio as

$$G'_t = G_0 + GT * t$$

where G'_t is the regression estimate of the ratio of CVA to GDP for any year t, G_0 is the year 0 change in the ratio (the regression intercept), and GT is the estimate of the effect of time on the trend (the coefficient of the independent variable). If GT is significant, it tells how much that change is accelerating or slowing with time.

From this starting point two new independent variables are introduced to assess whether or not the changes to the ratio are different during periods of war and recession than in other years. The model assumes that the change in any year t will consist of a baseline change (the intercept), any trend in the changes over time, and adjustments for recession and wartime conditions. This model assumes the form

$$G_t = G_0 + W * D_W(t) + R * D_R(t) + GT*t$$

D_W and D_R are dummy variables that assume values of 0 if that event (D_W for war and D_R for recession respectively) is not occurring, and 1 if it is. W and R then represent the regression coefficients for these dummy variables. They indicate how strongly these events affect the changes in the ratio, and can be assessed for statistical significance. If the intercept coefficient G_0 is non-zero and significant, it again suggests that the ratio of CVA to GDP is in fact changing over time independent of war and recession. The rate of these changes is increasing if the coefficient GT is positive and is decreasing if GT is negative.

The last factor considered here is the serial correlation of the data. It is clear that growth in any year is not truly independent of growth in the previous period or periods. Both intuition and a review of the GDP and CVA datasets suggest that growth during any period may be strongly influenced by previous period growth. Likewise, it may be possible that changes in the ratio itself are affected by the changes that closely preceded it. A regression is run to explore the severity of this impact of changes in one period on changes in subsequent periods. Growth in this case is estimated as

$$G_t = G_0 + RC_1 * Gt\text{-}1 + RC_2 * G_{t-2} + \ldots + RC_i * G_{t-i}$$

where RC_i is the regression coefficient reflecting the impact of growth from the period i years prior to the current period.

C. FORECASTING FUTURE CHANGES IN THE CVA TO GDP RATIO

Regardless of the model used, the findings in the next section will show that the corporate sector has in fact grown faster than the overall economy during all periods considered. Whether or not this strikes the reader as obvious, it should be apparent that such a trend cannot continue indefinitely. At some point the share of the economy contributed by the corporate sector must stabilize or even reverse, as CVA can never be more than 100 percent of GDP. Mathematically speaking, if A is truly and by necessity a subset of B, A can not indefinitely grow at a rate faster than B. By definition, corporate value added represents the subset of gross domestic product produced by the corporate sector. Therefore, its growth on average cannot exceed that of the overall economy in the long run.

Given this fact, it is useful to explore possible timeframes at which point the trends of the last 75 years must give way, and either GDP growth must accelerate or CVA growth must decline. If one assumes that GDP and CVA will initially continue to grow at their historical rates, it is possible to calculate the horizon before which these rates must change under a variety of estimates of the maximum share of GDP that can come from CVA. When modeling GDP and CVA by simple regression or a geometric average, estimates of the future values of either can be stated in the form

$$GDP_t = GDP_0 \, (G_{GDP})^t, \text{ and}$$

$$CVA_t = CVA_0 \, (G_{CVA})^t$$

where G_{GDP} and G_{CVA} are the estimated annual growth rates of gross domestic product and corporate value added. As mentioned already, by definition CVA can never be more than 100 percent of GDP. Therefore

$$CVA_t / GDP_t \leq 1 \text{ for all } t$$

In reality, the share of GDP that comes from CVA is likely to be limited to some amount less than 100 percent. Sole proprietorships, partnerships and government are likely to always make some contributions to GDP. For any percentage P_{MAX} chosen as the maximum feasible share of GDP contributed by CVA, the year T in which that share would be reached if historical growth rates continue can be calculated as follows:

$$P_{MAX} = CVA_T / GDP_T$$

$$P_{MAX} = CVA_0 \, (G_{CVA})^T / GDP_0 \, (G_{GDP})^T$$

$$P_{MAX} * GDP_0/CVA_0 = (G_{CVA}/G_{GDP})^T$$

$$T = \ln[P_{MAX} * GDP_0/CVA_0] / \ln(G_{CVA}/G_{GDP})$$

A variety of estimates of the highest level of economic output that can come from the corporate sector are presented. These estimates are then used in conjunction with this last equation to calculate points in the future beyond which the different models' estimates of growth would become mathematically impossible.

IV. FINDINGS

A. THE GROWTH OF THE CORPORATE SECTOR RELATIVE TO THE ECONOMY

The share of GDP contributed by CVA over the entire period from 1929 through 2005 is shown in Figure 1. It can be seen that the corporate share of GDP grew from 52.5 percent in 1929 to 59.7 percent in 2005. If the decision is made to exclude data prior to 1945 as outliers, the change is even more dramatic. CVA jumps from 44.6 percent of GDP in 1945 to 59.7 percent in 2005. Likewise, for those who argue that the U.S. has again been at war since 2001 and therefore the most recent years should be excluded, the range from 1945 through 2000 moves from the all-time low at 44.6 percent to the all-time high of 61.6 percent in 2000. While there have been periods where CVA has decreased as a percentage of GDP, the graph shows a strong upward trend with time.

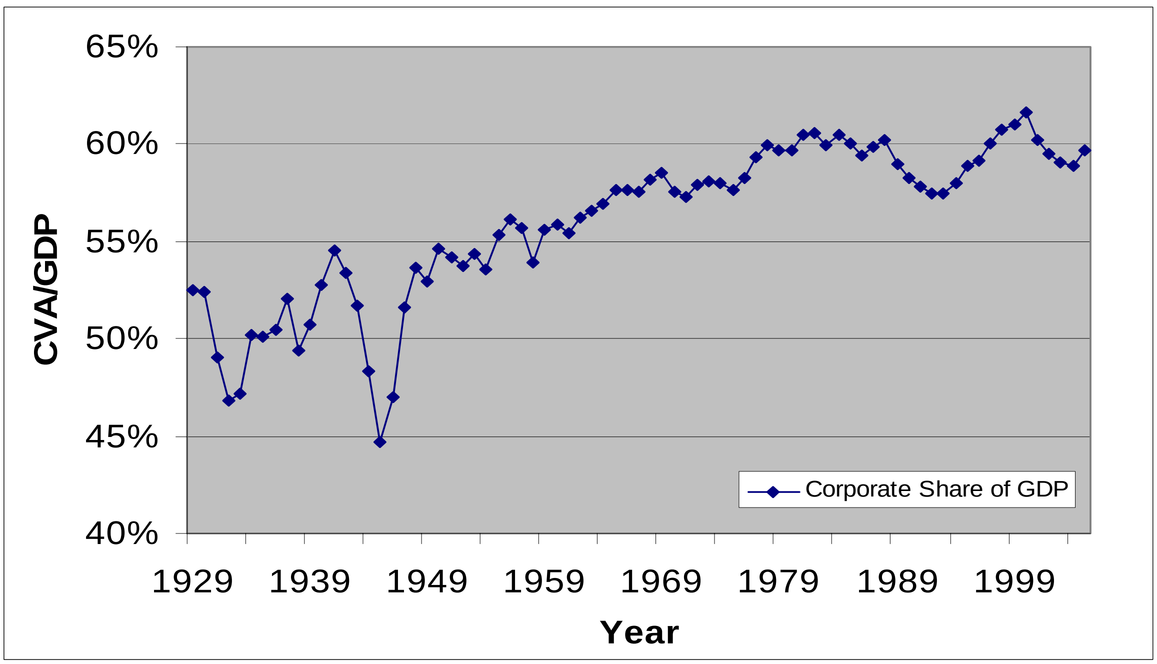

Figure 1. Corporate Share of GDP as Measured by Corporate Value Added

A regression analysis of the data depicted in Figure 1 verifies the visual effect. A linear regression of the ratio of CVA to GDP over time is significant at better than a 99 percent level of confidence, and the best fit estimate of the time coefficient suggests the ratio is increasing by 0.16 percentage points each year.[4]

Figure 2 shows the strong correlation between annual growth in CVA and that in GDP. The correlation coefficient between these numbers is 0.95. This relationship exhibits the widely acknowledged link between corporate growth and economic expansion. Running a regression with annual GDP growth as the independent variable and annual CVA growth as the dependent variable supports the picture painted thus far. While the intercept is not statistically different from zero, the coefficient is statistically greater than one. This supports the notion that at all levels of expansion, corporate growth is exceeding economic growth.

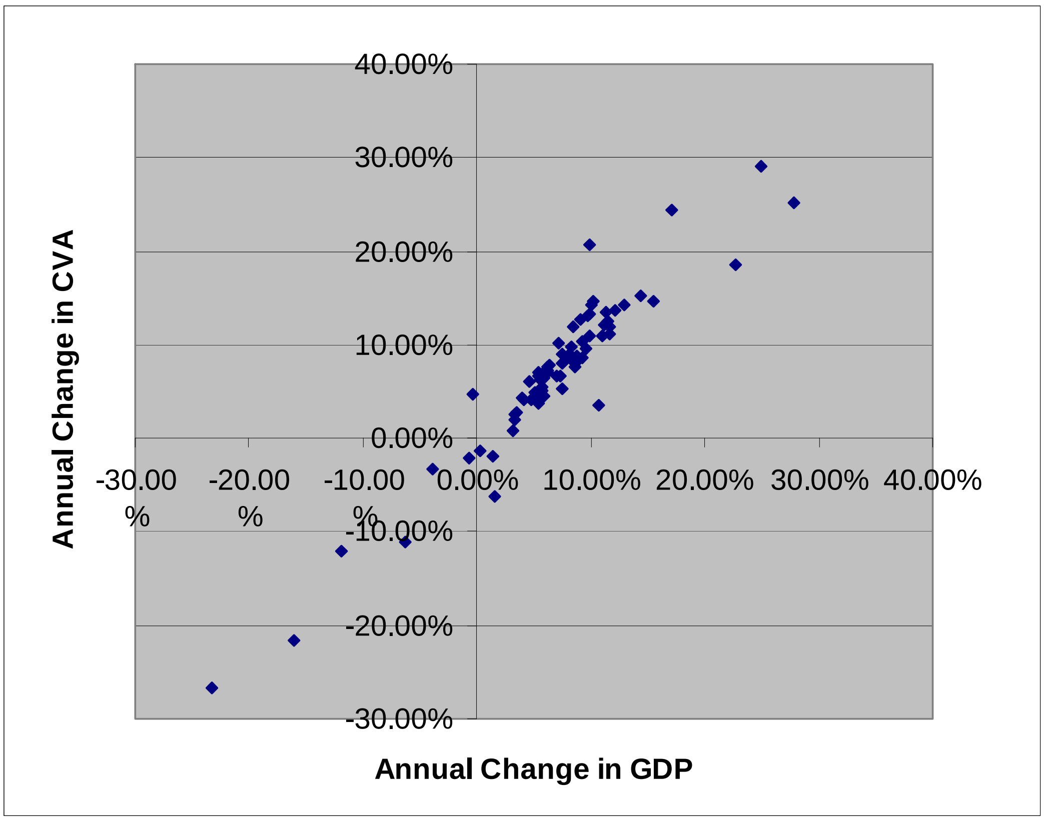

Figure 2. Correlation between CVA and GDP Annual Growth

[4] Regression summaries for most of the regressions presented in this section can be found at the end of the chapter.

Using the methodologies described in the previous section, the historical (geometric) average growth rates were also calculated for the three different periods. A summary of these results is shown in Table 1. For the entire 76-year period, CVA grew annually only 0.18 percentage points faster than GDP, with an annual average growth rate of 6.69 percent versus 6.51 percent for GDP. Still, even this small margin allowed CVA to capture an additional 7.2 percentage points of GDP over that time.

The profound effects of the Great Depression and World War II can be seen in the second case where these events are excluded by limiting the range to 1945-2005. While average GDP and CVA growth are both higher, the effect is much more significant for CVA. This allows the average annual difference between them to almost triple to 0.52 percentage points and explains how CVA increases its share of GDP by 15.1 percentage points over a period that is 16 years shorter. If one excludes the last four years and limits the range to 1945-2000, the effect is even more pronounced. The growth rate of CVA relative to GDP increases by 20 percent, or by 0.11 percentage points in absolute terms.

	Years Included		
	1929-2005	1945-2005	1945-2000
Number of Years in Sample	76	60	55
GDP Geometric Average	6.51%	6.94%	7.12%
CVA Geometric Average	6.69%	7.46%	7.75%
Annual Differential	0.18%	0.52%	0.63%

Table 1. Geometric Averages of GDP and CVA Growth

The regression models used to estimate the annual growth rates of CVA and GDP individually yield similar, if slightly less dramatic, results. Every log-linear model of either CVA or GDP has an adjusted R-squared over 0.99, and the models all satisfy F and t-tests at normal confidence levels. Table 2 below summarizes the GDP and CVA growth coefficients estimated by the simple regressions. Interestingly, the most significant growth disparity now occurs based upon the 1929-2005 data range, whereas this range had the smallest one using geometric averages.

	Years Included		
	1929-2005	1946-2005	1946-2000
Number of Years in Sample	76	59	54
GDP Growth Coefficient	7.59%	7.49%	7.67%
CVA Growth Coefficient	7.90%	7.72%	7.95%
Differential	0.31%	0.23%	0.28%

Table 2. Regression Estimates of GDP and CVA Growth

Regardless of the range of years included or the choice of a geometric average or regression estimate, the models clearly depict a situation where corporate growth is outrunning economic growth. As a result, the corporate sector's share of the economy is growing. Depending upon the choice of time period and model, CVA growth has exceeded that of GDP by between 2.8 percent and 8.1 percent. These results are surprising given the findings of other authors that earnings and profits as a percentage of the economy have not grown substantially.[5] An examination of the BEA data by this author produced similar findings regarding profits. With inventory and depreciation adjustments, after-tax profits have ranged from a high of 7.53 percent of GDP in 1929 to a low of -2.48 percent in 1933. Limiting the set to the years after World War II narrows the range of values. Profit's share of GDP peaks at 6.43 percent in 1965, and falls to a much-improved low 2.31 percent in 1974. A chart of the entire period is shown below in Figure 3.

[5] For example, see Siegel (2002) or Shiller (2005) for discussions of corporate profits as a share of gross domestic product.

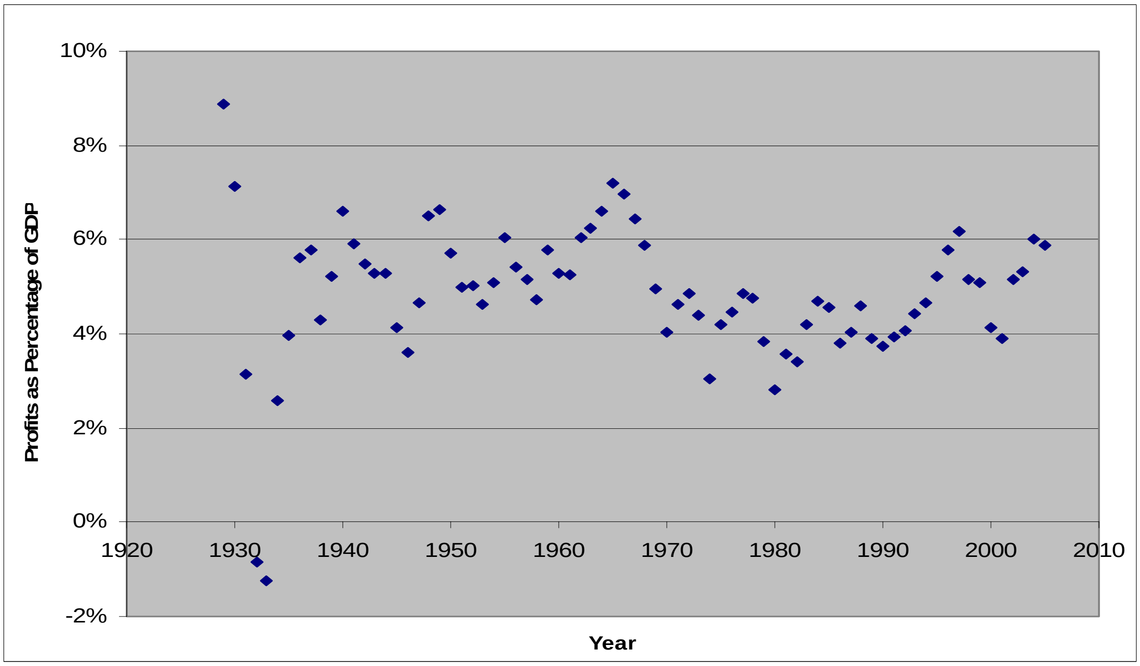

Figure 3. The Share of GDP Attributable to After-Tax Domestic Corporate Profits

An examination of the data yields several noteworthy points. First, the growing share of GDP that comes from the corporate sector seen in Figure 1 is not reflected in a corresponding increase in the profits of the corporate sector as a percentage of GDP here in Figure 3. While cyclical trends are clearly visible, no long-term trend is apparent. A regression of profits as a share of GDP over time shows the coefficient of the time variable to be essentially zero and of no statistical significance. This would suggest that profits as a percentage of GDP are exhibiting no long-term trend beyond random or cyclical variations. However, when the years before 1946 are again excluded, a statistically-significant trend does emerge. Surprisingly, it is a negative trend, implying that profits as a percentage of GDP are actually decreasing. For corporate value-added to be increasing its share of gross domestic product while profits are remaining steady or even decreasing as a share of GDP, by default corporate profits as a percentage of CVA must also be decreasing. Figure 4 depicts the data. While profits have indeed been a lower share of CVA in recent decades, the graph appears to suggest more of a sharp drop during the late 1960s than a steady decline throughout the period.

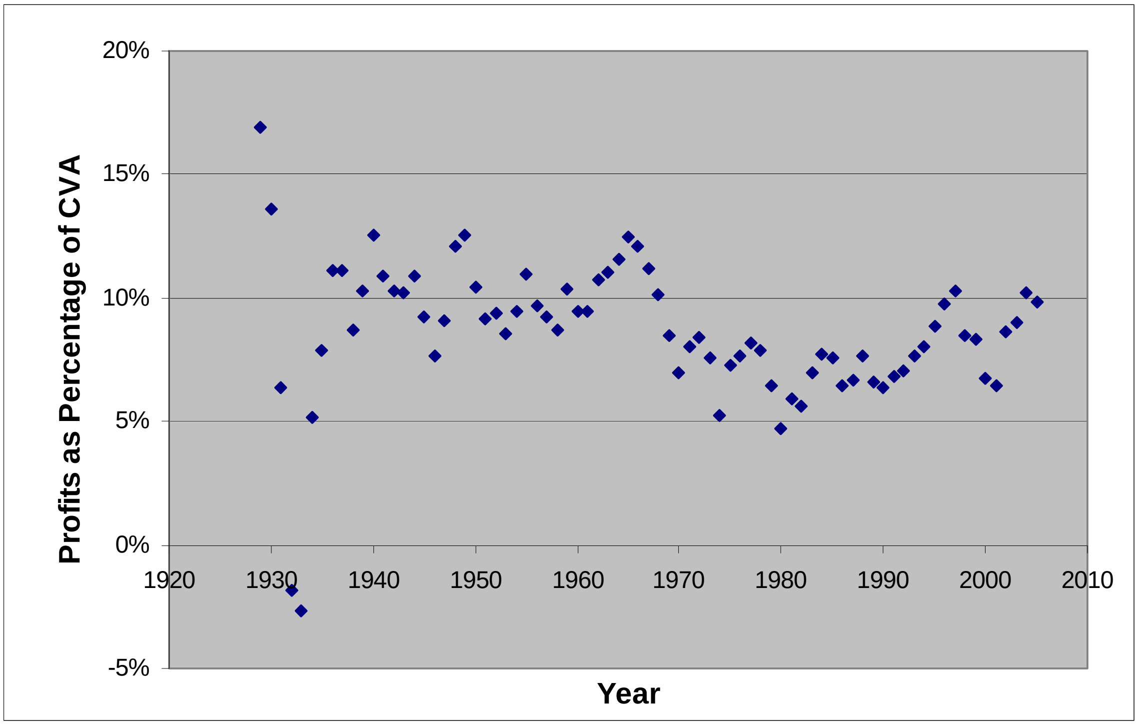

Figure 4. After-tax Domestic Corporate Profits as a Percentage of CVA

For 42 of the 76 years covered in the data, corporate value added has grown as a share of gross domestic product. A closer investigation of the exceptions yields several interesting points. Fifteen of the 34 years during which this ratio decreased included at least one quarter during which the U.S. was officially in a recession. Table 4 shows all of the U.S. recessions since 1929. Coincidentally, fifteen exceptions are also found during wartime. World War II and the Korean War account for six of them (1942, 1943, 1944, 1945, 1952 and 1953), while the more recent conflicts overlap with other periods of decline. Vietnam coincided with three of the years (1967, 1970 and 1971). The first Gulf War overlapped two more (1990 and 1991). If one accepts the war on terror as a true war in terms of its effects on economic and corporate growth then the decreases of the last four years (2001, 2002, 2003 and 2004) can also be accounted for in this manner.

Dates of Recession	Length of Recession (months)
August 1929 - March 1933	44
May 1937 - June 1938	14
February 1945 - October 1945	9
November 1948 - October 1949	12
July 1953 - May 1954	11
August 1957 - April 1958	9
April 1960 - February 1961	11
December 1969 - November 1970	12
November 1973 - March 1975	17
January 1980 - July 1980	7
July 1981 - November 1982	17
July 1990 - March 1991	9
March 2001 - November 2001	9

Table 3. U.S. Recessions Since 1929

A multivariate regression confirms these casual observations. While the regression only has an adjusted R-squared of about 0.32, the coefficients of both dummy variables and the time variable are all significant at better than 95 percent. When the effects of periods of war and recession are stripped from the data through the use of the dummy variables, corporate value added increases its share of gross domestic product by just over one percentage point annually. However, in recession years the effect is exactly the opposite: CVA's share of GDP declines by a similar amount. The impact of war is even more significant, with CVA losing two percentage points of GDP during wartime. If the years prior to 1946 are removed to exclude the particularly dramatic effects of the Great Depression and the Second World War, only the coefficient for the war variable is dramatically changed. The change associated with war is essentially cut in half, from a two percentage point decrease to just under a one percent decrease. Interestingly, the time variable shows an extremely small—one to two one-hundredths of a percentage point—slowing of the trend over time in all of these multivariate models.

The importance of separating the effects of war and recession from the underlying trends depends upon whether or not these events—recession and war—are unusual and therefore unlikely to reoccur in the future. If so, the effects of these years can be removed from the forecasts of future corporate and economic growth, and CVA's growth as a percentage of GDP will be faster. On the other hand, if such events are inevitable parts of the world, their impact cannot be excluded and the rate of change remains as forecasted earlier. Similar arguments can be made for and against the more limited approach of simply excluding the most dramatic of these events, most likely World War II and the Great Depression. While the likelihood of a war or recession on a scale comparable to these events is certainly less than that of minor conflicts or economic pullbacks, the arguments for and against including them are similar and still ultimately depend upon judgments that cannot be known with any degree of certainty.

The effects of serial correlation on the changes in the ratio of corporate value added to gross domestic product were also examined at lags out to six years. While the effects of the periods one and two years prior are consistently significant (for the models including data up to four years prior) at greater than a 90 percent confidence level, the impact of the third year prior is not statistically significant in any of the models. It is noteworthy that the positive impact any period's change in the ratio has one year later is almost exactly counterbalanced by its negative impact one year after that. These results suggest that while serial correlation is present in the data, its effects are predominantly felt in the near term.

This author was unable to find a single mention of this phenomenon—the growing share of economic output represented by corporate value added—in the relevant literature. This may be due to the fact that in the U.S. the term "value added" is used mostly in its general sense: to describe the efforts of firms to meet the needs of the marketplace in ever more innovative and efficient manners. The absence of its specific use as a corporate accounting term may have allowed this trend to quietly continue without attracting much attention. Furthermore, the trend is somewhat obvious: most people who have lived in the United States for any portion of this time period could attest to the growing role of corporations in the production of goods and services in this country. Large corporate players have entered almost every aspect of the economy, and have assumed prominent if not dominant roles in most. Figure 5 below shows the dominant position the corporate sector has maintained for over 40 years now. According to data from the Statistical Abstract of the United States, corporate entities have accounted for over 80 percent of U.S. business receipts since 1965. Therefore it is possible this transformation of the economy may have simply been taken as a given and, as such, not worthy of serious academic consideration.

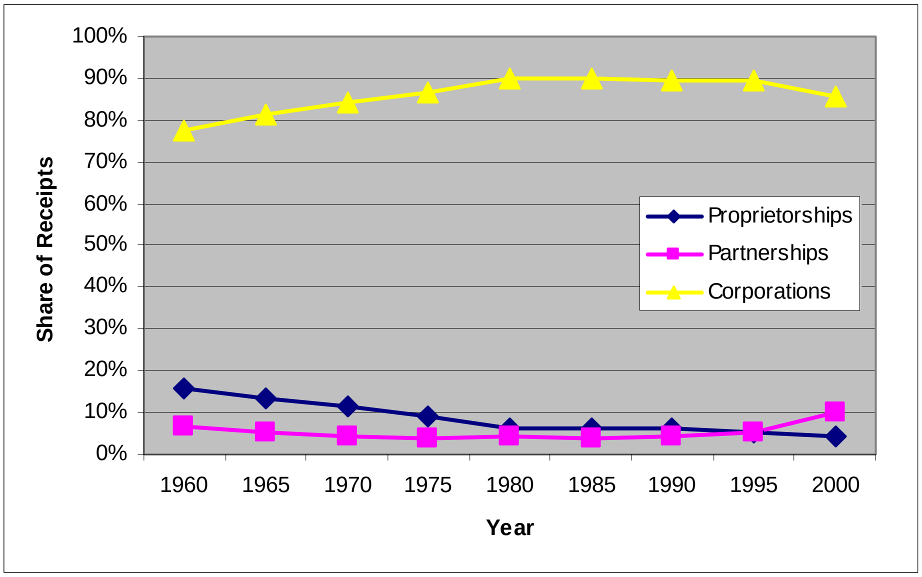

Figure 5. Share of Receipts by Business Type

B. FORECASTING WHEN THE HISTORICAL TREND MUST END

If the trend over the last century is considered obvious, it should be equally obvious that it can not continue indefinitely. Fundamental rules regarding sets preclude this. Simply stated, if A is truly and by necessity a subset of B, A can not indefinitely grow at a rate faster than B if A and B and their respective growth rates are all positive numbers. This is written mathematically as

$$A_0*(1+r_a)^t \leq B_0*(1+r_b)^t$$

where A_0 and B_0 are the initial values of A and B and r_a and r_b are the growths rate of A and B. It holds that if A_0, B_0, r_a and r_b are all positive numbers, the inequality can not hold indefinitely if r_a is larger than r_b. If the initial values of A and B are known and the growth rates are held constant, the exact time t at which point the inequality is violated can be solved for. By taking the natural log of both sides and then separating t, this point t is found to be

$$t = \ln(A/B)/\ln[(1+ r_b)/(1+r_a)]$$

Estimates of when corporate value added would reach 70, 80, 90 and 100 percent of gross domestic product were thus calculated using the various geometric and regression models of growth. A summary of the estimates is contained below in Table 3.

	Estimated Year in Which CVA Reaches Specified Share of GDP			
Method of Estimate (Years Included)	70%	80%	90%	100%
Separate Regressions (1929-2005)	2061	2108	2149	2186
Separate Regressions (1946-2005)	2081	2144	2200	2250
Separate Regressions (1946-2001)	2067	2120	2166	2207
Combined Regressions (1929-2005)	2071	2135	2199	2263
Combined Regressions (1946-2005)	2086	2166	2245	2324
Combined Regressions (1946-2001)	2077	2146	2216	2285
Separate Geometric Average (1929-2005)	2099	2178	2248	2311
Separate Geometric Average (1946-2005)	2038	2066	2090	2112
Separate Geometric Average (1946-2001)	2032	2055	2075	2093

Table 4. Estimated Year CVA Reaches Maximum Share of GDP

The fact that CVA growth exceeds GDP growth in every model suggests that corporate growth has come from two separate sources. First, the overall expansion of the economic pie has allowed the corporate sector's slice of it to grow at a rate commensurate to GDP growth. Second, the corporate sector has been growing relative to the other components. In effect, this extra annual growth has come at the expense of the non-corporate segments. As the corporate sector's share approaches 100 percent of economic production, this latter source of growth must, by definition, come to an end. Upon reaching that point, the only source still available for corporate growth would be the former, and therefore corporate growth would be limited to the overall growth rate of the economy. Furthermore, it should be apparent that the stabilization point—the point at which corporate growth depends solely upon economic expansion and not upon increasing its factor share—will come long before it actually reaches 100 percent of economic production. The two other main contributors to the economy, namely government and non-corporate business, are not going to completely disappear. Therefore, Table 3 includes estimates for ratios less than 100 percent. For example, if 70 percent is a more realistic estimate of the maximum corporate share of the economy, the models suggest this limit could be reached between as early as 2032 but no later than 2099.

It should be noted that the discussion thus far has been limited to both the corporate and economic production of the United States. As the prominence of the U.S. economy shrinks relative to the overall world economy, there is and should continue to be substantial room for corporate growth around the globe. At the same time, U.S. corporations will face an ever-expanding group of competitors in both overseas and domestic markets. It is impossible to say with certainty what effect these two opposing forces will have on the study presented here. While the impact of these international effects will figure prominently in the long-term prospects of individual corporations, the goal of this project was merely to examine the outlook on the domestic front in its aggregate. This issue is addressed a bit more fully in the next chapter on stock valuations, but more research on this topic needs to be done. Nonetheless, it should be noted that ultimately global corporate growth will face a similar ceiling—global economic growth. While both the size and horizon may be very different, the results and implications will be identical.

C. SUMMARY OUTPUTS FOR SELECTED LINEAR REGRESSIONS

1929-2005
Regression ln(GDP) vs. ln(time) base year 1929 = 1
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.995418889
R Square	0.990858764
Adjusted R Sq	0.990736881
Standard Error	0.158317421
Observations	77

Base GDP = 54.36996073
Growth rate = 1.075935338

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	203.7630809	203.7630809	8129.579595	3.18118E-78
Residual	75	1.879830425	0.025064406		
Total	76	205.6429113			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	3.995811809	0.03643824	109.6598462	1.49363E-84	3.923223113	4.068	3.923223113	4.068400505
ln(time)	0.073190365	0.000811745	90.16418133	3.18118E-78	0.071573285	0.075	0.071573285	0.074807445

1946-2005
Regression ln(GDP) vs. ln(time) base year 1946 = 1
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.996139598
R Square	0.992294099
Adjusted R Squ	0.992161239
Standard Error	0.112169223
Observations	60

Base GDP = 195.6429041
Growth rate = 1.074938782

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	93.97068525	93.97068525	7468.699235	5.46836E-63
Residual	58	0.729752206	0.012581935		
Total	59	94.70043745			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	5.27629108	0.029327819	179.9073817	2.20167E-81	5.217585073	5.334997087	5.217585073	5.334997087
ln(time)	0.072263713	0.000836176	86.42163638	5.46836E-63	0.070589924	0.073937501	0.070589924	0.073937501

1929-2005

Regression ln(CVA) vs. ln(time) base year 1929 = 1

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.995203452
R Square	0.990429911
Adjusted R Squ	0.99030231
Standard Error	0.168339931
Observations	77

Base CVA =	27.15859076
Growth rate =	1.079009649

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	219.9598122	219.9598122	7761.918044	1.77559E-77
Residual	75	2.125374916	0.028338332		
Total	76	222.0851871			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	3.301693415	0.038745015	85.21595427	2.10631E-76	3.224509388	3.378877441	3.224509388	3.378877441
ln(time)	0.076043629	0.000863134	88.10174824	1.77559E-77	0.074324177	0.07776308	0.074324177	0.07776308

1946-2005

Regression ln(CVA) vs. ln(time) base year 1946 = 1

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.995861926
R Square	0.991740975
Adjusted R Squ	0.99159608
Standard Error	0.117582037
Observations	59

Base CVA =	29.8439911
Growth rate =	1.07720352

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	94.62944514	94.62944514	6844.541051	4.53219E-61
Residual	57	0.788055522	0.013825535		
Total	58	95.41750066			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	3.395983516	0.045782654	74.1762053	2.15796E-58	3.304305335	3.487661698	3.304305335	3.487661698
ln(time)	0.074368349	0.00089891	82.7317415	4.53219E-61	0.072568314	0.076168385	0.072568314	0.076168385

1946-2001

Regression ln(CVA) vs. ln(time) base year 1946 = 1

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.996556559
R Square	0.993124976
Adjusted R Squ	0.992995259
Standard Error	0.102878026
Observations	55

Base CVA =	101.0977854
Growth rate =	1.079460815

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	81.03092521	81.03092521	7656.06399	5.33291E-59
Residual	53	0.560946074	0.010583888		
Total	54	81.59187128			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	4.616088221	0.028126836	164.1168665	2.02177E-73	4.559672933	4.672503509	4.559672933	4.672503509
ln(time)	0.076461671	0.000873858	87.49893708	5.33291E-59	0.074708933	0.078214408	0.074708933	0.078214408

1929-2005

Regression CVA/GDP vs. time base year 1929 = 1

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.870924745
R Square	0.758509911
Adjusted R Squ	0.755290043
Standard Error	0.019859371
Observations	77

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.09290823	0.09290823	235.5717518	7.58451E-25
Residual	75	0.029579596	0.000394395		
Total	76	0.122487826			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.498846513	0.004570821	109.1371895	2.13256E-84	0.489740971	0.507952054	0.489740971	0.507952054
Time	0.001562853	0.000101826	15.34834687	7.58451E-25	0.001360007	0.0017657	0.001360007	0.0017657

1946-2005

Regression CVA/GDP vs. time base year 1946 = 1

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.818242275
R Square	0.669520421
Adjusted R Squ	0.663822497
Standard Error	0.015646568
Observations	60

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.02876639	0.02876639	117.5025231	1.43602E-15
Residual	58	0.014199275	0.000244815		
Total	59	0.042965665			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.53714063	0.004090959	131.2994372	1.80686E-73	0.528951685	0.545329574	0.528951685	0.545329574
Time	0.001264348	0.000116639	10.83985808	1.43602E-15	0.00103087	0.001497826	0.00103087	0.001497826

1946-2000

Regression CVA/GDP vs. time base year 1946 = 1

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.836607945
R Square	0.699912853
Adjusted R Squ	0.694250831
Standard Error	0.015214502
Observations	55

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.028614615	0.028614615	123.6153616	1.81536E-15
Residual	53	0.012268496	0.000231481		
Total	54	0.040883111			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.533742229	0.004159642	128.3144509	9.03949E-68	0.525399043	0.542085415	0.525399043	0.542085415
Time	0.001436853	0.000129234	11.11824454	1.81536E-15	0.001177643	0.001696063	0.001177643	0.001696063

1929-2005 Profits as Share of GDP vs. time

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.016454452
R Square	0.000270749
Adjusted R Squ	-0.013058974
Standard Error	0.014861499
Observations	77

ANOVA

	df	SS	MS	F	Significance F
Regression	1	4.48612E-06	4.48612E-06	0.020311674	0.887052227
Residual	75	0.016564813	0.000220864		
Total	76	0.016569299			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.04888391	0.003420514	14.29139488	4.16137E-23	0.042069898	0.055697923	0.042069898	0.055697923
time	-1.08599E-05	7.61998E-05	-0.142519032	0.887052227	-0.000162658	0.000140938	-0.000162658	0.000140938

1946-2005 Profits as Share of GDP vs. time

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.271633292
R Square	0.073784646
Adjusted R Squ	0.057815415
Standard Error	0.009618649
Observations	60

ANOVA

	df	SS	MS	F	Significance F
Regression	1	0.000427474	0.000427474	4.620425931	0.035777036
Residual	58	0.005366068	9.25184E-05		
Total	59	0.005793542			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.054029103	0.002514897	21.48362872	2.6882E-29	0.048994991	0.059063216	0.048994991	0.059063216
time	-0.000154127	7.17031E-05	-2.149517604	0.035777036	-0.000297657	-1.05977E-05	-0.000297657	-1.05977E-05

1929-2005 Profits as Share of CVA vs. time

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.186662229
R Square	0.034842788
Adjusted R Squ	0.021974025
Standard Error	0.027656735
Observations	77

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.00207099	0.00207099	2.707547591	0.104059321
Residual	75	0.057367125	0.000764895		
Total	76	0.059438115			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.095712536	0.006365457	15.03623906	2.43829E-24	0.083031895	0.108393176	0.083031895	0.108393176
time	-0.000233335	0.000141805	-1.645462729	0.104059321	-0.000515826	4.91553E-05	-0.000515826	4.91553E-05

1946-2005 Profits as Share of CVA vs. time

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.438960791
R Square	0.192686576
Adjusted R Squ	0.178767379
Standard Error	0.016751443
Observations	60

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.003884559	0.003884559	13.84322506	0.000450571
Residual	58	0.016275429	0.000280611		
Total	59	0.020159988			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.100206846	0.00437984	22.87910962	1.02058E-30	0.091439643	0.108974049	0.091439643	0.108974049
time	-0.000464617	0.000124875	-3.720648473	0.000450571	-0.000714582	-0.000214652	-0.000714582	-0.000214652

1929-2005

CVA Annual Growth vs. GDP Annual Growth

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.95148442
R Square	0.905322602
Adjusted R Squ	0.904043178
Standard Error	0.026497243
Observations	76

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.496809778	0.496809778	707.6015417	1.28225E-39
Residual	74	0.051955686	0.000702104		
Total	75	0.548765464			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-0.005401699	0.004169763	-1.295445221	0.199193334	-0.013710132	0.002906734	-0.013710132	0.002906734
X Variable 1	1.122140752	0.042184504	26.60078085	1.28225E-39	1.038086293	1.20619521	1.038086293	1.20619521

1929-2005

Serial Correlation, t-1

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.252181051
R Square	0.063595282
Adjusted R Squ	0.050767821
Standard Error	0.013127226
Observations	75

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.000854339	0.000854339	4.957744802	0.029059462
Residual	73	0.012579656	0.000172324		
Total	74	0.013433995			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.000755332	0.001518904	0.497287335	0.620480973	-0.002271839	0.003782503	-0.002271839	0.003782503
t-1	0.25258462	0.113439635	2.226599381	0.029059462	0.026499758	0.478669483	0.026499758	0.478669483

1929-2005

Serial Correlation, t-1 and t-2

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.400264341
R Square	0.160211542
Adjusted R Squ	0.136555529
Standard Error	0.012012396
Observations	74

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	0.001954526	0.000977263	6.772550519	0.002032504
Residual	71	0.010245133	0.000144298		
Total	73	0.012199659			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.00142353	0.001401194	1.015940897	0.313107113	-0.001370371	0.004217432	-0.001370371	0.004217432
t-1	0.324108961	0.107331706	3.019694494	0.003514251	0.110095621	0.538122301	0.110095621	0.538122301
t-2	-0.300681763	0.107336342	-2.801304365	0.006553685	-0.514704346	-0.086659179	-0.514704346	-0.086659179

1929-2005

Serial Correlation, t-1, t-2 and t-3

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.38933086
R Square	0.151578518
Adjusted R Squ	0.114690628
Standard Error	0.011971783
Observations	73

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	0.001766822	0.000588941	4.109167436	0.009646877
Residual	69	0.009889328	0.000143324		
Total	72	0.01165615			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.001778011	0.001415491	1.25610876	0.213313009	-0.001045817	0.004601839	-0.001045817	0.004601839
t-1	0.243960426	0.11845265	2.059560729	0.043215714	0.007653858	0.480266994	0.007653858	0.480266994
t-2	-0.250285409	0.1136681	-2.201896642	0.031018192	-0.477047062	-0.023523756	-0.477047062	-0.023523756
t-3	-0.127250655	0.112755489	-1.128553971	0.262994686	-0.352191699	0.097690388	-0.352191699	0.097690388

1930-2005

CVA/GDP Ratio Change as a Function of War, Recession and Time

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.590383101
R Square	0.348552206
Adjusted R Squ	0.321408548
Standard Error	0.01102647
Observations	76

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	0.00468375	0.00156125	12.84101816	8.25041E-07
Residual	72	0.008753979	0.000121583		
Total	75	0.013437728			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.012197518	0.003143883	3.879762548	0.000229118	0.005930303	0.018464733	0.005930303	0.018464733
War	-0.020286541	0.00459441	-4.415483862	3.4784E-05	-0.029445329	-0.011127753	-0.029445329	-0.011127753
Recession	-0.013359406	0.002833919	-4.714110853	1.1547E-05	-0.01900872	-0.007710093	-0.01900872	-0.007710093
Time	-0.000138708	6.2117E-05	-2.233011673	0.028657359	-0.000262536	-1.488E-05	-0.000262536	-1.488E-05

1946-2005

CVA/GDP Ratio Change as a Function of War, Recession and Time

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.579938523
R Square	0.33632869
Adjusted R Squ	0.30077487
Standard Error	0.008334873
Observations	60

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	0.0019715	0.000657167	9.459706126	3.74928E-05
Residual	56	0.003890326	6.94701E-05		
Total	59	0.005861826			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.013391741	0.002543117	5.265877053	2.29363E-06	0.008297266	0.018486216	0.008297266	0.018486216
War	-0.008998474	0.005195907	-1.731838732	0.08880796	-0.019407127	0.00141018	-0.019407127	0.00141018
Recession	-0.010352002	0.002463973	-4.201345548	9.61827E-05	-0.015287933	-0.005416071	-0.015287933	-0.005416071
Time	-0.000251795	6.61677E-05	-3.805414173	0.000352715	-0.000384345	-0.000119246	-0.000384345	-0.000119246

V. STOCK MARKET IMPLICATIONS OF SLOWER CORPORATE GROWTH

The previous chapter examined historical growth rates of the corporate and national accounts from a value-added perspective and explored theoretical time horizons at which domestic corporate growth would on average be limited to that of the overall economy. This chapter explores the resulting question likely to be on every investor's mind: "What do these findings mean for stock market valuations and investing?" It opens with a basic review of stock valuations, discusses the assumptions needed to apply this model to the topics at hand, calculates the implications of these findings for stock valuations, and then presents a few conclusions about what effects different sets of assumptions might have.

A. BASIC STOCK VALUATIONS

For any equity investment in a corporate entity, the return to the investor is the summation of two components: the dividend payments and the appreciation of the investment captured at the time of sale. The return to the investor is therefore the sum of these cashflows denoted as

$$\text{Cashflows to Investor} = D_1 + D_2 + D_3 + \ldots + D_t + P_T$$

where D_t is the dividend payment made in any period t and P_T is the price the stock can be sold for in the last period T. Because these inflows occur over time, and a dollar tomorrow is less valuable than a dollar today, the cash to the investor must be discounted by the time value of money r. This is also known as the opportunity cost of capital, which represents the return the investor might have gotten elsewhere, and the minimum compensation he requires for giving up the use of his money. By discounting these payments, the fair price of the stock P—ignoring taxes and certain other complicating factors—is found to be

$$P = D_1/(1+r) + D_2/(1+r)^2 + D_3/(1+r)^3 + \ldots + D_T/(1+r)^T + P_T/(1+r)^T$$

As the holding period T approaches infinity, the present value of the last term—the appreciation of the stock—goes to zero if the stock appreciates at a rate less than the discount rate r. If the dividend payments and required return remain constant this equation simplifies to

$$P = D/r$$

A second simplified case is that of a stock which pays no dividends, but is expected to appreciate and be worth some greater value at the time of sale T in the future. As there are no payments except that received from selling the stock at the later date, the present value or fair current price in this case is

$$P = P_T/(1+r)^T,$$

where P_T is the expected value of the holding in the future and r is again the opportunity cost of capital.

In reality, a stock return is usually due to both dividend payments and appreciation of the stock price, the dividend is growing, and the time horizon for cashing out is significantly less than infinity. If the rate of dividend growth is constant, this vastly more complex case can be dramatically simplified. The price of the stock at any point in the future should in theory reflect the present value (in that later period) of the discounted cash flows still to be made to the stockholder. As a result, appreciation of the stock price is merely a reflection of higher expected dividend payments, and the entire value is again just the present value of all future dividend payments.[6]   If the dividend grows perpetually at a constant growth rate g, the fair price of the stock is

$$P = D_1/(r-g),$$

where D_1 is the amount of the first dividend payment. It is with this equation, constrained by the assumptions of the next section, that the implications of the previous chapters are assessed.

[6] For a more elaborate explanation of this concept, refer to Brealy, Myers and Allen (2006), p. 62.

B. ISSUES AND ASSUMPTIONS

Any attempt to apply the aforementioned stock valuation techniques to the market faces several obvious problems. Likewise, attempts to apply such models to the entire corporate sector as understood by value-added methodologies face additional difficulties. The main concerns are:

- Dividend payments and their growth rates do not appear constant over time, there are questions as to whether the cost of capital is constant over time, and all three vary across both industries and firms.
- Most people agree that stock prices, at least in the short run, do not appear bound by such rational price determinations.
- The return to the investors is more accurately depicted as what they receive after taxes.
- Corporate value added has no posted price in the stock market.
- The stocks of corporations change hands over time, and new corporations are formed.

Each of these issues is addressed in the following sections.

1. Dividend Payments, Dividend Growth and the Expected Rate of Return

Clearly dividend payments by companies and the growth rate of these dividends vary over time, at times significantly. Likewise, there is substantial debate over whether or not the required return to capital remains constant. To fit the data into a useful model, several assumptions are made here. First, it is assumed that the return to capital r is constant for any given level of risk. This means in the long run investors have demanded and will continue to expect the same return to capital investments. This does not preclude variances, as the constant return is an expected return and not an actual return. All that is required is for the investors' expectations to remain constant over time. They can even expect periods where performance is better or worse than this return, as long as previous or subsequent periods revert to the mean in such a way as to make the return approximate r.[7]

Assuming that the required return is constant still raises the question "Constant at what level?" Financial theory generally predicts a positive correlation between the return to an investment and the riskiness of the firm or project involved. This relationship stipulates higher expected returns for riskier endeavors. In the capital asset pricing model (CAPM), the relationship between risk and reward is linear and expressed as

$$r = r_f + \beta(r_m - r_f)$$

where r_f is the return of a risk-free investment, β is that investment's covariance with the market divided by the variance of the market, r_m is the return from investing in the market as a whole, and $(r_m - r_f)$ is the risk premium associated with taking on risk levels different than that of the market.

A model like the CAPM predicts that the only risk rewarded in the marketplace is that which can not be diversified away. This risk which is not diversifiable is also known as market risk. In this study the investment being examined is the entire domestic corporate sector. Because this "investment" is very closely tied to the performance of the U.S. stock market, β in this case should be very close to one. In that case, the previous equation simplifies to

$$r = r_m$$

Therefore, the required rate of return is simply that which is required of the market as a whole, which is assumed to be constant over time.

The next assumption addresses the dividend paid (D) and the growth rate (g) of those payments over time. Here it is assumed that the dividends D grow at a constant rate g. In other words the dividend D_t in any period t can be expressed as

$$D_t = D_0 * (1+g)^t$$

[7] For a more complete discussion of how mean reversion affects expected returns, see Siegel (2002).

While dividends do actually vary over time, historical trends suggest they are generally increasing, and that in the long run that growth seems to be mean reverting. Figure 6 below depicts actual dividends paid since 1929. A best fit log-linear regression line has been overlaid to give a sense of how well such a constant growth model represents the underlying data, and thus how good an assumption a constant g might be. The regression has an adjusted R-squared of about 0.96, and both the intercept and the coefficient are statistically significant.

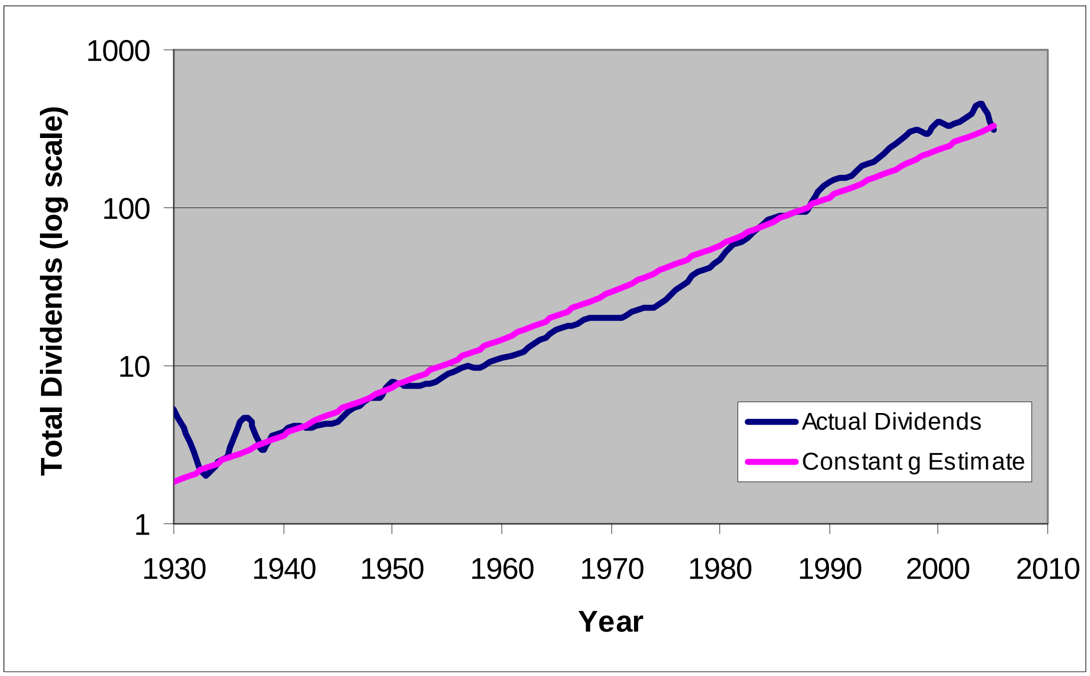

Figure 6. U.S. Dividends Since 1929

While the discussion thus far presents stock valuations in terms of dividends, the market more often speaks of valuations in terms of earnings. In essence, dividends are simply the portion of a corporation's earnings which it elects to return to the owners. As a result, the size of this return over time then is dependent on two things: the growth in earnings for the company and its decision as to how large a portion of those earnings to return to the owners, also known as the payout ratio. Therefore, the dividend in any period can also be portrayed as

$$D_t = E_t * p_t$$

where p_t is the payout ratio—the percentage of earnings paid out as dividends—in any year t. If earnings growth is constant at the growth rate g, the last two equations can be combined as

$$D_t = E_0 * (1+g)^t * p_t$$

When g is held constant, it should be apparent that the payout ratio p_t must also be constant by necessity if D is expected to grow at a constant rate. History shows that this rate has in fact varied over time, as can be seen in Figure 7 below. While the constraints that g and p_t remain constant are relaxed later, they provide a baseline case from which to begin.

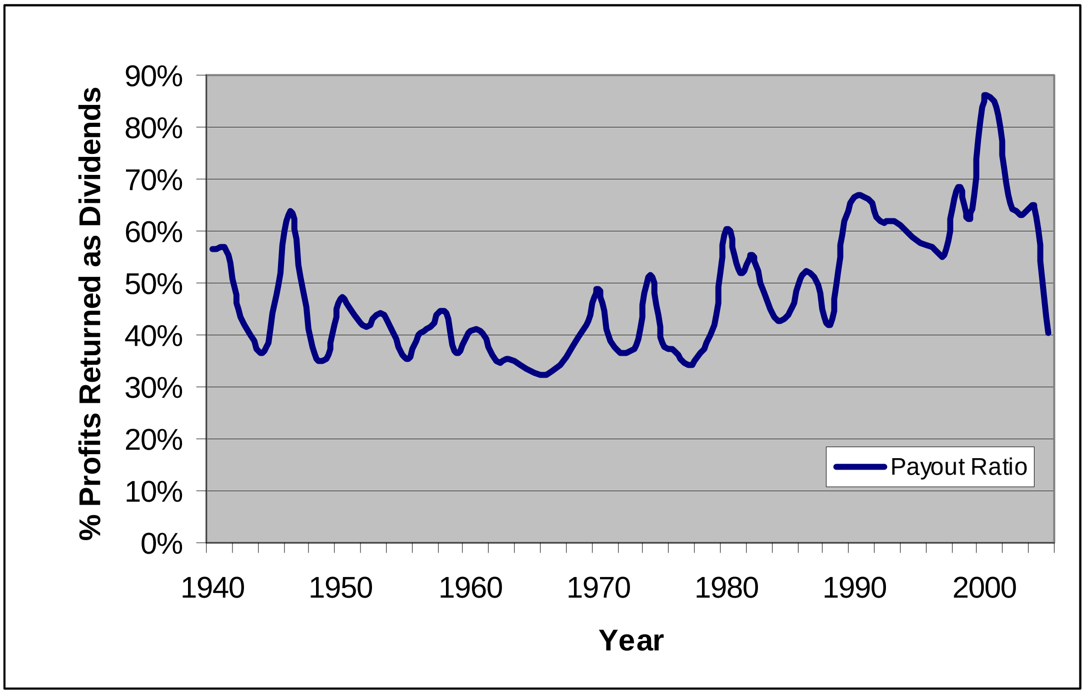

Figure 7. Payout Ratios for U.S. Corporations Since 1940

2. Are Markets Rational?

Anyone who has watched the markets can attest to the apparent irrationality of their movements at times. Cutler, Poterba and Summers (1989) examined the largest single-day movements in the last century of the U.S. stock market. They argue that fewer than 1 in 4 of them can be explained by any logical event or new information that would lead investors to change their estimates of dividends (or earnings), expected growth rates, or required rates of return. Likewise, many experts join Schiller (2005) in arguing the market today is significantly overvalued based on historical growth assumptions. Opposing them are the so-called “new economy” theorists, who argue that the economy has undergone a seismic shift following which old models are no longer valid. Amidst such chaos one might question whether there is any value in making analytical valuations when either the world is irrational or such old economy techniques no longer apply.

The best argument against the accusation of irrationality is time. Allowing for some illogical valuations in the short run (of even years perhaps), markets have consistently and repeatedly corrected back to levels more consistent with underlying—and therefore rational—valuations in the long run. While this may be of little immediate consolation to the investor whose portfolio is currently underwater, it should provide comfort to those who take the long-term view and provide reassurance that rationality will eventually prevail. From an economic standpoint, the money made during such deviations from underlying valuations is better thought of as income transfers and not returns. When viewed in this light it is those who sell when markets are overpriced who will make money on the short term irrationality, and therefore even the short-lived gains will largely go to the rational investor.

Whether or not the new economy arguments can be dismissed as easily depends on what is meant by the term. If the belief is that the old equations of valuing assets can be discarded, the proponents of such views are likely to suffer the same fate as the irrational investors. In fact, they essentially are one and the same. Changes to the underlying structure can change the estimates plugged into the equations, but they can not change the inherent way value is created and measured. Valuations that move away from these fundamentals are, in effect, bubbles, and sooner or later they correct. However, if what is meant by the new economy is that growth rates or required returns have changed, their arguments at least deserve to be heard. The effects of changing the estimates of future growth and rates of return are examined more carefully in a later section.

3. The Implications of Taxes on Valuations

If presented with the two following investments, which would the investor prefer: a prospect which nominally offers a return of $2, but half of which has to be given up in the form of taxes, or an investment that pays only $1 but pays no taxes? Obviously, in the end both actually produce one dollar of usable income to the investor, and therefore are both equally valued by the financial analyst. This simple example is meant to highlight an important point—that taxes matter. Not only does the tax code in the U.S. provide dozens of nuances that affect the returns to an investor, but also the implications of the tax code vary by the type of investor, by the form of investment and by year. Sorting out this chaos is a growth industry for both accountants and lobbyists alike, but in general the details are well beyond the scope of this analysis. For the purposes here, it should suffice to acknowledge the ramifications of taxation, and to assume all cash inflows are net of tax.

4. Pricing the Entire Market

If one is trying to calculate the fair price of a publicly traded stock or a basket of such stocks, it is easy to do so if he feels confident in his estimates of future dividends and the rate of return. Indices such at the Dow, NASDAQ and S&P 500 indicate the prevailing market valuation of their underlying portfolios any given time. If however the desired basket is the domestic corporate sector, no such price is readily available for several reasons. First, the inclusion of all U.S. corporations in the value-added data means that numerous companies whose stocks are not widely traded are included. While the government data does not include S corporation data in its corporate totals, there are still many corporations whose stocks are either privately held or thinly traded that are not part of these indices. As a result, there is no readily available market price for their stocks, and so their contribution to the basket is not readily identifiable. While future studies may explore this issue, it is assumed here both that the major corporations included in the indices constitute the bulk of U.S. corporate activity and that their performance measurements are sufficiently representative of the overall corporate segment.

The second problem is that even for the publicly traded companies, the posted stock price reflects the market value of the entire organization, which often includes both foreign and domestic operations. The corporate value-added data is comprised of domestic production only, so the contribution of the foreign production by domestic corporations would have to be excluded. Likewise, the U.S. production of foreign companies needs to be included for similar reasons. The extent of this concern is difficult to determine, partially due to the difficulty in discerning, from government data available, the net effect. While corporate profits received from the rest of the world are published, corporate payouts to the rest of the world are lumped in with all income payments to foreign entities in the NIPA accounts. The incomplete portrait is mixed. Profits from overseas have jumped from 4.2 percent of overall corporate profits in 1948 to 14.8 percent in 2005.[8] This could be taken as implying that U.S. corporations are substituting overseas growth for domestic growth. On the other hand, overall income receipts from the rest of the world have remained nearly balanced with income payments to the rest of the world. The difference between the two was only $31.8 billion in a $12,456 billion economy. This suggests that for every bit of growth U.S. companies find overseas, they are surrendering an equivalent amount in the domestic markets. For this reason, it is assumed that the opposing trends have a neutral effect overall.

Therefore, to impute a price of this domestic corporate production, it is assumed that the P/E ratio of the S&P 500 serves as a close approximation for the P/E ratio of this related but not identical basket of corporate activity. While this assumption ignores the impact of smaller companies and does not account for the global nature of the firms in this index, the author is confident it will suffice for an initial evaluation of domestic corporate business prospects.

[8] These calculations are a compilation of data taken from a number of BEA tables, mainly Table 1.7.5, Table 1.13 and Table 1.14. The breakdown of National Income by legal form of organization data is only available back to 1948. Overseas corporate profits rose from $1.3B (of $31.2B total) in 1948 to $197B (of $1,330B total) in 2005.

5. Ownership Changes and the Survivor Bias

The last issue concerns changes occurring over time within the market. These include ownership transfers, new entrants and the departure of old corporations. The transfer by sale of ownership from one party to another is not a large concern in the analysis at hand. While many researchers are particularly interested in who possesses the stock over time, here it simply does not matter. As in the GDP accounts themselves, the transfer of an asset (in this case ownership of the corporation) from one party to another is immaterial in accounting for its performance. The outcome—the growth in earnings and the dividends paid—is what matters. Likewise, the price paid above or below fair market value for any individual transaction is also immaterial. Any premium or discount relative to the underlying value paid by the buyer is merely a transfer of wealth from the buyer to the seller, or vice versa. While the return to the individual is affected, this return is the summation of the actual return on the investment and this transfer. Because the income transfer has both a winner and a loser, the overall effects of this portion cancel each other out when aggregated. The remaining return will be that of the stock itself, priced at its underlying fair value. This truth affects numerous cases: a transfer of stock from one individual to another, the purchase of a company by another, the spin-off of a division into a separate company, and the stock going from publicly held to privately held corporation (or vice versa). Therefore, the transfer of the stock has no relevance to the calculations. In the cases where a private business becomes corporate (or vice versa), the corporate value added data captures these changes in status, and therefore should accurately reflect such alterations in the market.

The second concern is how to handle the emergence of new corporations and the demise of old ones. In the financial sector, this issue can significantly distort performance calculations and is known as the survivor bias. In essence, it reflects the fact that indices are updated over time, with new companies being added as they become significant forces in the market and others being removed as they fade into oblivion. Because companies are added while they are growing, and dropped while they are fading (or even imploding), the indices tend to reflect an upward bias. While this is a serious concern, it should not affect the value-added data here. Because the underlying data are an aggregate of all domestic data, the losses incurred by the underperformers are accounted for and accurately marked against the earnings of the overall segment. For any year, the destruction of value committed by the weakest businesses is factored in with the creation of value by the best, and fully accounted for in an economic sense.

C. VALUING THE DOMESTIC CORPORATE MARKET

Armed with the above assumptions, one can make some observations about current market valuations. One of the most frequently used yardsticks used measure value in the stock market is the price-to-earnings (P/E) ratio. This ratio evaluates the price of a share of a corporation as a multiple of either the present year's actual or the upcoming year's expected earnings. As the earlier analysis calculated the fair price of a stock as the discounted present value of the cash dividends, one last conversion is needed. Because dividends are equal to earnings times the payout ratio, the price of a stock with steadily increasing earnings and a constant payout ratio can be written as

$$P = E_1 * p_1/(r-g).$$

By moving earnings to the left side, the equation can be rewritten in terms of a P/E ratio as

$$P/E = p_1/(r-g)$$

Given any three of the four variables (price-to-earnings ratio, payout ratio, required rate of return and expected growth), the remaining unknown can be determined.

Choosing an appropriate value for the payout ratio p is difficult. As shown in Figure 7, the ratio has been as high as 1 in 1938 and reached a low of 0.3 in 2000. The current ratio of about 0.4 is used here as a baseline assumption. While somewhat less volatile, P/E ratios have also exhibited significant variability. Figure 8 depicts the P/E ratios for the S&P 500 since 1929, as calculated by Schiller (2005).[9] A P/E ratio of 25 is chosen as representative of the monthly average since 2002.

[9] For interested parties, Shiller has made all of his underlying data available for review at www.irrationalexuberance.com. Site last accessed 3 December, 2006.

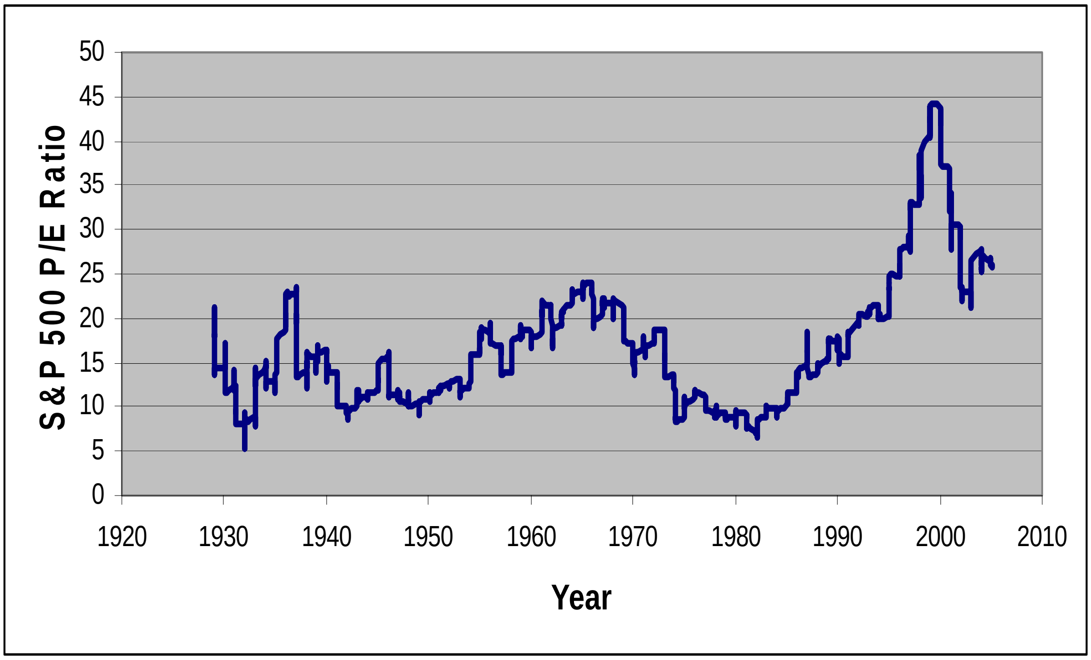

Figure 8. Price to Earnings Ratio for the S&P 500

Ibbotson and Chen's calculation (2003) of an average real market return since 1926 of 7.4 percent per year is used as an estimate of the required market return r.[10] Substituting these values into the equation, it is possible to calculate the expected dividend growth implied by current market valuations:

$$25 = 0.4/(0.074\text{-}g), \text{ or}$$

$$g = 5.8\%$$

In other words, if dividends could grow at a rate of 5.8 percent annually indefinitely, a P/E ratio of 25 represents the fair price of a market portfolio if the investor demands a 7.4 percent return and can expect a payout ratio of about 40 percent of earnings. This would also require earnings to grow at 5.8 percent per year if the payout ratio is to hold steady. Furthermore, since it is unlikely that profits as a percentage of value-added will increase, this will require corporate value-added to increase at the same

[10] Ibbotson and Chen estimate that the risk-free return over this period was 2.05 percent annually, and the risk premium for the market was 5.24 percent. The real annual return to the market is therefore calculated as (1 + 0.025)*(1 + 0.0524), which equals 1.074 or 7.4 percent.

rate. However, for the reasons spelled out in previous chapters, the main argument of this paper is that earnings growth of 5.8 percent cannot be maintained if economic growth is only in the range of 2 to 3 percent annually forecasted. Specifically, assuming that the U.S. can not find a way to increase annual economic growth above the expected 2 to 3 percent, ultimately dividend growth will have to slow to approximately the same rate.

Given such limitations, one can ask what such a slowdown would imply for the market valuations. If the same assumptions for payout ratios and the return demanded are used but expected growth is decreased from 5.8 to 3.5 percent, the fair P/E ratio can be calculated as follows:

$$P/E = 0.4/(0.074-0.035) \text{ or}$$

$$P/E = 10.3$$

If the investor still expects a 7.4 percent return but can only hope for 3.5 percent growth in dividends, this implies a fall in the price of the market portfolio of almost 60 percent. Does this mean that the market is currently overpriced (based on the stated assumptions) by 140 percent? The answer is “not exactly”. For such a precipitous drop to be warranted, the new growth rate would have to take effect immediately. However, the slowdown this paper predicts is not that imminent. In the short run, corporate value-added may continue to expand its share of gross domestic product. This would allow corporate earnings and therefore dividends to grow faster than economic growth. If dividends can grow at the initial rate of 5.8 percent for years before slowing to the steady-state pace, the appropriate P/E ratio then is indeed much higher than the 10.3 just calculated. Determining the P/E ratio in such a case requires a two-stage model of dividends, where dividend growth is at a certain rate g_1 initially until time t, and then changes to g_2 thereafter until time T. In such cases the P/E ratios can be expressed as

$$\begin{aligned} P/E = {} & p_1/(1+r) + p_1(1+g_1)/(1+r)^2 + \ldots + p_1(1+g_1)^{t-1}/(1+r)^t \\ & + [p_1(1+g_1)]^{t-1}(1+g_2)/(1+r)^{t+1} + [p_1(1+g_1)]^{t-1}(1+g_2)^2/(1+r)^{t+1} \\ & + [p_1(1+g_1)]^{t-1}(1+g_2)^{T-t}/(1+r)^T \end{aligned}$$

If the latter period is again thought to be of infinite duration, the second half of the right side of the equation can be simplified such that[11]

$$P/E = p_1/(1+r) + p_1(1+g_1)/(1+r)^2 + \ldots + p_1(1+g_1)^{t-1}/(1+r)^t$$
$$+ [p_1(1+g_1)^{t-1}(1+g_2)/(r-g_2)]/(1+r)^t$$

This equation can be used to calculate a fair P/E valuation based on one's estimates of the payout ratio (p_1), required return (r), the expected growth in each stage (g_1 and g_2), and the time t at which the change in growth rates occurs. Using the same assumptions for p_1 and r, the initial dividend growth is assumed to be the 5.8 percent calculated earlier, while an optimistic economic growth rate of 3.5 percent is used for g_2. By selecting a wide range of horizons t at which this slowdown might occur, one can infer the appropriate P/E for each case. Table 5 below shows these values.

Number of Years Before Slowdown	Implied Fair Market P/E Ratio	Required Price Drop To Reach Fair Value
5	11.76	53%
10	12.31	51%
20	14.08	44%
30	15.60	38%
50	18.04	28%
100	21.71	13%

Table 5. Fair P/E Ratio for Various Slowdown Horizons

The calculations highlight several points. First, it should be readily apparent that if the assumptions made thus far are valid, then the current P/E ratios are too high. Even if the slowdown does not occur for 100 years, a P/E ratio of 25 is still 13 percent above the calculated fair value. Second, because saying that earnings are 13 percent too low would have little meaning, it is fair to say that under these conditions the price is 15 percent too high. While the magnitude of the required correction decreases as the horizon of the slowdown is extended out, the fact remains that a correction is required.

[11] See Brealey, Myers and Allen (2006) or Fair (2000) for a more thorough discussion of two-step stock valuation models.

D. THE IMPACT OF ALTERNATIVE ASSUMPTIONS

The analysis to this point has relied on specific assumptions about the growth rate (g), the return required by the investor (r), and the payout ratio (p) to illustrate in simplest terms the effects of slower growth on stock valuations. What valuations one thinks make sense is largely shaped by one's expectations about these values in the future. While the values chosen attempt to approximate either recent or historical conditions found in the market, it would be easy for anyone to reach different conclusions about the best values to use. With that in mind this section attempts to anticipate some of these potential objections by examining the effects of changes in one or more of the previous assumptions.

1. New Economy Growth

Since the boom of the 1990s, new economy theories abound, suggesting that future growth rates will break out of the traditional range predicted by economists and history alike. Hanson (2000) takes the argument to its limit, arguing that future growth could produce a scenario where the doubling of output is measured in days rather than years. These theories generally hold that technology will drive innovation and productivity growth well above anything witnessed thus far. This would allow output growth dramatically in excess of the growth of inputs to production. While such revolutionary growth would produce dramatic improvements in the quality of life, it would also enable profit growth for corporations in excess of that forecast here. Although the bursting of the dotcom bubble took some of the passion out of the new economy proponents, it is worth discussing how such changes could affect the model presented here.

To consider the effects of unprecedented growth, one must first decide whether he believes this new growth will be solely in the corporate sector, or if it will spill over into the economy as a whole. If the answer is the latter, then the waters ahead are truly uncharted. Such a case would increase the growth rates of both the economy and corporations. The g in the models would not be limited in the long run to the paltry 2-3 percent GDP growth forecasted by the government and most economists, but instead to whatever new growth rate the economy can sustain. While appealing, this growth would come despite the predictions of most everyone involved in forecasting exactly these numbers.

In simple terms, production is determined by three components: capital, labor, and the productivity with which they are used. With the exception of a jump in the decade surrounding 1940, output per unit of capital has remained relatively constant over time (Blanchard and Fischer, 1989), and it does not appear that new economy theorists expect that to change. Likewise, population growth in the U.S. is estimated at only about 1 percent per year. While major changes in labor participation rates or hours worked could also provide one-time lifts to GDP, the upcoming retirements of the baby boomers suggest this is a highly unlikely scenario. It is for these reasons that the productivity component is the most focused upon and hotly debated driver of growth forecasts. If population growth is at 1 percent, and hours worked per person remain steady, productivity would in essence have to increase at 2.5 percent annually just to reach the 3.5 percent overall growth rate used earlier for this study. Such productivity gains, while wonderful, lie above most estimates of what can be hoped for.[12] Therefore, while this is not impossible, it would seem the overwhelming majority of analysts are not counting on these types of gains.

If, on the other hand, this new growth were to improve corporate productivity while leaving the overall economic productivity unchanged, the disjoint between the corporate and economic sectors is only made worse. If economic growth is estimated at 3.5 percent and corporate growth 4.1 percent annually, it would take 51 and 89 years for corporate value added to reach 80 percent and 100 percent of GDP respectively. If corporate growth increases—to say the 5.8 percent calculated in the last section—but the economy continues to grow at the 3.5 percent used before, the year before which CVA reaches its maximum level of GDP jumps even closer. Such a large change in the growth rate of corporate value added would see it reach 80 percent of GDP in a mere 13 years,

[12] Estimates of future annual productivity gains include 2.2 percent through the year 2016 (Congressional Budget Office, 2006b), 1.7 percent through 2080 (Board of Trustees, 2006) and 1.4 percent through 2016 and beyond (Government Accounting Office, n.d.).

and an implausible 100 percent of GDP only ten years after that. Such incredible numbers highlight the improbability that such a growth disparity could persist for very long. While corporate growth may at times pull away from economic growth in the short run—it has averaged over 4 percent in real terms for most of the last decade—the increased disparity between corporate and economic growth will only accelerate the arrival of the eventually inevitable slowdown.

2. Changes in the Required Return

The second change worthy of consideration is the possibility that the required return r has changed. Siegel (2002) argues that due to decreases in economic volatility and a better understanding of risk, investors have lowered the risk premium and therefore the total return required for investing in the market. While he generally avoids calculating a number, he does mention a range of 4 to 5 percent as a real possibility. It is possible to substitute this alternative value into the earlier equation and find the new appropriate P/E ratio. If 3.5 percent is still used for g and 0.4 for p, but 5 percent is now used for r:

$$P/E = 0.4/(0.05-0.035)$$

$$P/E = 26.67$$

Surprisingly enough, the reasonable long term P/E ratio in this case closely matches the actual present P/E ratio. Such an explanation of today's P/E ratios would be consistent with some of Siegel's conclusions as well. While most of the time his outlook is more bullish, he does allude to the possibility of P/E ratios in the 20s accompanied by lower future returns.

The validity of this explanation is untested at present. It is unlikely a survey of investors would produce such a low number as their expected future market return. Likewise, admissions of such a target by corporate America would likely be met by a massive selloff in the equities markets. These facts argue against this possible justification of current market valuations. Still, the theory is appealing to the extent it provides a justification that fits both present P/E ratios and future expected growth estimates into a coherent model. Only further analysis and time itself can answer the question of whether or not it actually has merit on its side.

3. Changes to the Payout Ratio

The final element of the model presented here that can significantly alter the valuations is the payout ratio. The large historical volatility in payout ratios leaves room for honest disagreements over what should be expected in the future. This argument is bolstered by the fact that this ratio presently stands near the low end of its historical range. Holding the other variable steady, a change in the payout ratio would increase cashflows to the investor. Higher cashflows lead in turn to higher prices, which finally generate a higher justified P/E ratio. However, there is likely a relationship between payout ratios and future growth that lies deeper than the superficial analysis presented here. Earnings not paid out as dividends are retained by the company and invested internally in the development of future products and more efficient production methods. This feedback mechanism should allow decreases in the payout ratio to drive increases in the future growth rate. In essence, this connection between the two will make it hard to change the payout ratio while holding everything else constant.

Setting aside momentarily the possible interaction between the variables, it is interesting to examine the effects of a change to the payout ratio. For example, an examination of the P/E equation suggests a perfect correlation between the payout ratio p and the P/E ratio. A doubling of the payout ratio to 0.8 would allow the P/E ratio to double, while a 20 percent decrease in the payout ought to cause a 20 percent decrease in the P/E ratio.

Setting aside temporarily the issue of the interplay between payout ratios and growth, one last point can be noted about the relationship between payout ratios and P/E valuations. Suppose that the required return remains 7.4 percent and long term growth is indeed limited to 3.5 percent. Is it possible a change in the payout ratio could justify a P/E ratio of 25? Plugging this set of numbers into the equation:

$$25 = p/(0.074-0.035)$$

$$p = 0.975.$$

Therefore, if corporations were to pay nearly every cent of earnings—97.5 percent to be exact—in dividends, the market could justify the present P/E ratio while meeting historic returns to investors within this diminished growth scenario. However, for the reasons listed above one must be skeptical of such analysis. It is unlikely that the corporations could meet the capital investment requirements of even this lower growth without retaining a higher share of their earnings or radically altering their debt-to-equity ratios. The former would again decrease the payout ratio, while the latter would increase the default risk and therefore cause investors to demand a higher rate of return. How all of the forces ultimately come together is uncertain.

This chapter has attempted to answer questions regarding how limits to growth in corporate value added could affect returns to investors in the market. While numerous assumptions must be made to fit the data into standard valuation models, these assumptions do not differ that greatly from those in a one-stock valuation. The analysis presented in this chapter lends weight to notions that the market is indeed overpriced at present P/E ratios near 25. However, it is possible that actual values for the different unknowns could justify valuations near those found at present.

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VI. CONCLUSIONS

There can be little doubt that corporations have been expanding their presence in the U.S. economy. A casual observation of the business landscape quickly finds industries and niches that, having once been served by thousands of small proprietors, are now becoming the domain of several dominant players. While some might lament the loss of the local "mom-and-pop" producer, it is likely that the trend has been fueled by the choices of millions of consumers preferring the price, standardization, or range of selection offered by the corporate competitor that replaced it. As a result, corporate production in the United States has grown even faster than the economy as a whole. In an economy expected to grow by only 2 to 4 percent annually in the decades ahead, this additional growth is vital if corporations are to meet the expectations of their investors. At the same time, it must be acknowledged that this source of growth cannot continue forever. At some point the corporate sector will expand its piece of the economic pie as far as is possible. After that point aggregate corporate growth in domestic production will be limited to the rate achieved by the economy as a whole.

It is extremely difficult to estimate the point in the future when this will be the case. Economists are still struggling to build models that can accurately forecast growth out more than a few quarters, and exogenous shocks can leave even the best forecast in tatters. War, changes in fertility rates and productivity-altering innovations are just a few of the events that can have dramatic impacts on growth. If the trends of the last century are any guide this limit could be reached in a little as a couple of decades, or perhaps not for hundreds of years. Although impossible to say with any certainty, it seems fair to say that many people alive today could still be around when this point finally arrives. While it might not be so close as to affect the day-to-day choices of the average consumer, it could very easily affect the strategic choices of individuals, businesses and governmental organizations alike.

In no area would the effects of a slowdown in corporate growth be felt more than in the stock market. Stock prices are largely driven by expectations regarding future earnings, and solid growth is the expectation. A slowdown, even if decades down the road, would have negative consequences on today's prices if recognized. Such a downturn would affect not only the ability of the corporations to raise future capital, but also how much the stockholder must save for his retirement and how much revenue the government can expect to have at its disposal.

Despite the gloomy outlook offered, the findings presented here do not preordain an unpleasant future for the stock market. As mentioned repeatedly, this study looks only at the domestic portion of corporate production, which is decreasing in importance as a source of earnings for most large corporations. The globalization of the economy is opening up new possibilities and new markets for growth. Companies that are successful at capturing these markets, or creating entirely new markets through innovation, will thrive and their stocks will be rewarded. However, the globalization of production and trade also brings challenges. For every producer they squeeze overseas, domestic corporations will face a new competitor looking to "steal" their domestic market.

The interplay between these two opposing forces—the ability of corporations to compensate for limited domestic growth through expansion into foreign markets, and the threat of foreign producers to their current market share—is the piece of the puzzle most in need of further study. There can be no doubt that corporate value added cannot exceed gross domestic product. Therefore the ability of corporations to supplant this current domestic growth with a new source overseas will determine whether the evidence presented here precipitates a correction in the markets or merely serves as a footnote as corporate growth moves elsewhere.

Two other areas stand out as prime targets for future investigation. First, more complex methods of estimating growth are likely to yield better forecasts of future growth. As they apply to the issues presented here, the real gains will come not simply from a better forecast of economic or corporate growth, but from a better ability to forecast the disparity between the two. As the precision is improved, the massive range in the forecast horizons can be narrowed. The largest remaining source of uncertainty in the models then would be the question of what percentage of GDP can really come from corporations.

Second, the reliance here on historical or recent averages of payout ratios and required rates of return leaves something to be desired. Siegel's notion that high P/E ratios might be warranted by a decrease in the rate of return required in equity markets is worth exploring. Additionally, a better explanation of the feedback loop between payout ratios and future growth would help create a more concise picture of what is likely to happen if corporate growth slows. Such a slowdown presumably would produce higher payout ratios as companies return earnings to investors as dividends for want of worthwhile growth opportunities. An improved understanding of these effects would allow better stock valuations than the ones presented here.

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